

PROGRAM



10.07.2026-10.10.2026

Qingdao Innovation and Development Center,

Harbin Engineering University

Qingdao West Coast, China

United Nations Educational, Scientific and Cultural Organization

International Day of Light



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Greetings

Dear Colleagues and Friends,

On behalf of the organizing committee of the 3rd International Conference on Advanced Energy and Functional Materials Research (AEFM 2026), we are delighted and honored to welcome you to Qingdao, China, from October 7 to 10, 2026.

Advanced energy, functional materials, and nano/integrated photonics are rapidly evolving pillars of a sustainable, intelligent, and interconnected future. Their convergence is enabling breakthroughs across energy conversion and storage, novel material functionalities, nanoscale light–matter interactions, and next-generation photonic and information technologies, from high-efficiency solar cells and advanced battery systems to ultra-compact meta-lenses and quantum photonic circuits, reshaping the frontiers of both fundamental science and technological innovation.

AEFM 2026 serves as a premier interdisciplinary platform, bringing together leading scientists, emerging researchers, engineers, and industry professionals worldwide. Jointly organized by Harbin Engineering University and Wiley journals, the conference bridges academic excellence with high-impact scientific publishing. The program features distinguished keynote addresses, oral and poster sessions, and extensive networking opportunities, fostering cross-disciplinary exchange among materials chemists, physicists, engineers, and photonics researchers. We are confident that such collaboration will accelerate scientific discovery and catalyze practical solutions to pressing global challenges in energy and sustainability.

The conference will take place in the scenic West Coast New Area of Qingdao, a beautiful coastal city renowned for its rich cultural heritage, modern urban development, and vibrant research environment. We trust that this inspiring setting will enrich your conference experience and leave you with lasting memories beyond the lecture halls.

We sincerely thank all sponsors, funding agencies, institutional partners, and volunteers for their dedicated support, without which this conference would not have been possible.

On behalf of the entire organizing committee, we warmly encourage you to actively participate in the scientific discussions, share your cutting-edge research, and engage with fellow participants from diverse backgrounds. Through open dialogue and collaborative spirit, we can collectively push the boundaries of knowledge and shape a better future for our planet.

We are looking forward to seeing you at the 3rd AEFM in Qingdao, China!

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Synopsis of the Daily Program

Wednesday, 7th October, 2026	
14:00-20:00	**Registration**
14:00-17:00	**HEU Museum -Free Visiting**
18:00-20:00	**Day 1 Dinner: 1F Canteen, Counters 5-8** **食堂 1 楼，5-8 窗口**

Thursday, 8th October, 2026	
Plenary Talk Session **Lecture Hall (Room 467) of Building #11**	
8:30-8:45	**Opening Speech** Prof. Dr. Wenxin Wang, Conference Chair Harbin Engineering University
8:45-8:55	**Greeting from the Former Conference Chair** Prof. Dr. Yong Lei, Conference Co-Chair Technical University of Ilmenau
8:55-9:05	**Greeting from Qingdao West Coast New Area** Ms. Nan Zhao, Deputy Head Qingdao West Coast New Area
9:05-9:15	**Greeting Speech from Former Minister-Counsellor for Education, Chinese Embassy in Germany** Prof. Qi Dong Tongji University
9:15-9:30	**Greeting Speech from Harbin Engineering University** Prof. Zhiwen Yu, Vice President Harbin Engineering University
9:30-10:00	**Acceptance or Rejection: Insider Tips for Rapid and Successful Publication in Top Journals-Insights from the Advanced and Small Journals** Dr. Neville Compton, Editor-in-Chief Small

10:00-10:20	**Photo + Coffee Break**
10:20-10:50	**Optomechanical Springs for Extreme Microforce Metrology** Prof. Dr. Min Qiu Westlake University
10:50-11:20	**III-V semiconductor nanowire arrays for next generation optoelectronics** Prof. Dr. Lan Fu The Australian National University
11:20-12:15	**Wiley Journals Panel discussion**
12:15-13:30	**Lunch** Multifunctional Hall, Second Floor of Zhushan Restaurant **珠山餐厅二楼多功能厅**
13:30-14:00	**Well-defined nanostructuring for electrochemical energy conversion and storage** Prof. Dr. Yong Lei Department of Applied Nano-Physics, Institute of Physics, Technical University of Ilmenau, Germany
14:00-14:30	**Nano Green Printing and Manufacturing Technology** Prof. Dr. Yanlin Song Key Laboratory of Green Printing at the Institute of Chemistry, CAS
14:30-15:00	**Near-field microscopy: from Microwave to Terahertz Frequencies** Prof. Dr. Yalin Lu University of Science and Technology of China
15:00-15:30	**From Trial and Error to Rational Design-Advances in Optical Measurement Technologies for Microfabrication** Dr. Haiwei Yin Ideaoptics Co., Ltd.
15:30-16:00	**Graphene: structural basis, sustainable manufacturing of almost defect-free graphene powders, and applications** Prof. Dr. Guosheng Shao Zhengzhou University

16:00-16:10	**Coffee Break**
16:10-16:35	**Key Materials and Energy Storage Mechanisms for Zinc-Based Batteries** Prof. Dr. Shun Wang Lishui University
16:35-17:00	**Development and Status of Integrated Microcavity Optical Gyroscopes** Prof. Dr. Yonggang Zhang Harbin Engineering University
17:00-17:25	**Recent Advances in Ghost Imaging Research at Shanghai Institute of Optics and Fine Mechanics** Prof. Dr. Shensheng Han Shanghai Institute of Optics and Fine Mechanics, CAS
17:25-17:50	**Powering the future via solid state chemistry** Prof. Dr. John TS Irvine School of Chemistry, University of St Andrews
17:50-18:15	**Hybrid perovskite materials and the application in lasers** Prof. Dr. Zhijie Wang Institute of Semiconductors, CAS
18:30-20:00	**Day 2 Welcome Banquet** Multifunctional Hall, Second Floor of Zhushan Restaurant **珠山餐厅二楼多功能厅**
14:00-17:00	**HEU Museum (1st floor Building #11) - Free Visiting**

Friday, 9th October, 2026	
8:30-10:00	**Editorial Meeting of EEM** **Room 466 of Building #11**
11:00-12:00	**Youth Editorial Meeting of EEM** **Room 453 of Building #11**
Forum 1: Nano-Functional Materials **Room 440 of Building #11**	
8:30-8:50	**Controlling Energy Transfer in Lanthanide Nanocrystals via Atomic Engineering** Prof. Dr. Lingdong Sun Peking University
8:50-9:10	**Brightening upconversion nanoparticles** Prof. Dr. Guanying Chen Harbin Institute of Technology
9:10-9:30	**Super artificial enzyme with well-defined catalytic centers resembling natural enzymes** Prof. Dr. Aoneng Cao Shanghai University
9:30-9:50	**Single-Cell Geometric 3D Genome Reconstruction by Sequential-GAM and High-Precision Fluorescent Signal Detection by DEPAF** Prof. Dr. Juntao Gao Tsinghua University
9:50-10:10	**Materials, Devices, and Systems for Smart Gas Sensors and Electronic Nose** Prof. Dr. Xiaohong Xia Hubei University
10:10-10:30	**Optically Addressing Spin Relaxation Mechanism in 2D Hybrid Organic-Inorganic Perovskites** Prof. Dr. Hai Wang Jilin University
10:30-10:40	**Coffee Break**

10:40-11:00	**Halide perovskite integrated photonics** Prof. Dr. Sergey Makarov Harbin Engineering University
11:00-11:20	**Structure modifications of layered oxides cathode materials for sodium-ion batteries** Prof. Dr. Jun Wang Southern University of Science and Technology
11:20-11:35	**Photothermal conversion and thermal storage properties of graphene and MXene based aerogel confined inorganic phase change materials** Prof. Dr. Fulai Zhao Shandong University of Technology
11:35-11:50	**Carbonized polymer dots luminescent materials** Prof. Dr. Siyu Lu Zhengzhou University
11:50-12:05	**Tunable Diffractive Optical Elements on Single-Walled Carbon Nanotubes for Terahertz Wavefront Reconstruction** Elizaveta G. Tsiplakova ITMO University, Harbin Engineering University
12:05-12:20	**Reaction-Mediated Additive Engineering Enables Interfacial Coordination and Surface Defect Regulation in $Cs_3Cu_2Cl_5$ Nanocrystals** Prof. Dr. Dongling Geng Civil Aviation University of China
12:00-13:30	**Lunch** Multifunctional Hall, Second Floor of Zhushan Restaurant **珠山餐厅二楼多功能厅**

Forum 2-1: Advanced Energy and Environmental Materials Room 439 of Building #11	
8:30-8:50	**Reverse-Bias Degradation in Perovskite Solar Cells and Modules: From Outdoor Power-Station Evidence to Interfacial Solutions** Prof. Dr. Peng Gao Fujian Institute of Research on the Structure of Matter, CAS
8:50-9:10	**Advanced thermophotonics for plasmonic printing and radiative cooling** Prof. Dr. Dangyuan Lei City University of Hong Kong
9:10-9:30	**Zero-Carbon Traction Power Supply Technology for High-Speed Maglev** Prof. Dr. Bo Zhang Institute of Electrical Engineering, CAS, University of Chinese Academy of Sciences
9:30-9:50	**Excited-State Dynamics in Organic Photovoltaics** Prof. Dr. Xiaotao Hao Shandong University
9:50-10:10	**Glass scintillator: A window to future radiation detection and imaging** Prof. Dr. Jing Ren Harbin Engineering University
10:10-10:30	**Operando X-ray Spectroscopy for Sustainable Energy Storage and Conversion** Prof. Dr. Peng Zhang Zhengzhou University
10:30-10:40	**Coffee Break**
10:40-11:00	**Electrocatalysis of Small Alcohol Molecules** Prof. Dr. Jinfa Chang College of Chemistry, Northeast Normal University

11:00-11:20	**Electrolyte Design and Interfacial Performance Regulation for Solid-State Sodium-Ion Batteries** Prof. Dr. Feng Liang Kunming University of Science and Technology
11:20-11:40	**Lanthanide Contraction Regulates the Structure, Photocatalysis, and Terahertz Response of PMo12-Based Rare-Earth Methylenediphosphonate Complexes** Prof. Dr. Qionghua Jin Capital Normal University
11:40-12:00	**Green Separation and Value-Added Recycling of Photovoltaic Waste** Prof. Dr. Shaoyuan Li Kunming University of Science and Technology
12:00-13:30	**Lunch** Multifunctional Hall, Second Floor of Zhushan Restaurant 珠山餐厅二楼多功能厅
13:30-13:50	**Enhanced Functional Surface Induced by Laser Micro/Nano - Manufacturing for Environmental Applications** Prof. Dr. Rui Zhou Institute of Optics and Electronics, CAS
13:50-14:10	**Beyond Band Alignment: Engineering Ultrafast Carrier Dynamics at Buried Photocatalytic Interfaces** Prof. Dr. Bing Jin Shandong University
14:10-14:25	**Research progress of electrode materials and their potassium storage mechanism for potassium-based energy storage devices** Prof. Dr. Shuoqing Zhao Jilin University
14:25-14:40	**Interconnected Microporous Carbon for Boosted Capacitive Kinetics and Practical Application** Prof. Dr. Su Zhang China University of Petroleum (East China)

14:40-14:55	**Research on perovskite-based tandem solar cells** Prof. Dr. Zhiqin Ying Ningbo Institute of Material Technology and Engineering, Chinese Academy of Sciences
14:55-15:10	**In situ solidified electrolyte for lithium metal batteries.** Prof. Dr. Anjun Hu Chengdu University of Technology
15:10-15:20	**Coffee Break**
15:20-15:35	**Molecular Engineering of Orbital-Overlap-Driven Weakly Coordinating Solvation and Its Application in Low-Temperature Lithium Batteries** Prof. Dr. Shuhua Wang Shandong University
15:35-15:50	**The In-Plane Thermoelectric Performance in SnSe Crystals** Prof. Dr. Haonan Shi Taiyuan University of Science and Technology
15:50-16:05	**Surface/interface charge regulation and energy harvesting devices** Prof. Dr. Zhihao Zhao Beijing Institute of Nanoenergy and Nanosystems, CAS
16:05-16:20	**Design and performance regulation of multi-metal catalysts for oxygen evolution reaction** Prof. Dr. Kai Zeng Southwest Jiaotong University
16:20-16:35	**Corrosion-inspired Zn anode materials for aqueous batteries** Prof. Dr. Zhao Cai China University of Geosciences
18:00-19:00	**Day 3 Dinner: 1F Canteen, Counters 5-8** **食堂 1 楼，5-8 窗口**

Forum 2-2: Advanced Energy and Environmental Materials Room 440 of Building #11	
13:30-13:45	**Photoelectrode Design for Photo-Assisted Lithium-Sulfur Batteries** Prof. Dr. Yibo He Northwestern Polytechnical University
13:45-14:00	**Porous Amorphous and High-Entropy Materials: Design and Applications in Energy Storage** Prof. Dr. Zhifeng Wang Hebei University of Technology
14:00-14:15	**Interface Design and Energy Storage Mechanism of Potassium-Ion Battery Anodes** Prof. Dr. Kangzhe Cao Xinyang Normal University
14:15-14:30	**Design of Dual-Functional Photoactive Materials and Investigation of Photo-Charging Performance for Photo-Rechargeable Batteries** Prof. Dr. Yingying Zhao Harbin Engineering University
14:30-14:45	**Intrinsic zero-strain anodes and their ion storage mechanism** Prof. Dr. Fei Wang Kunming University of Science and Technology
14:45-15:00	**High Thermal Conductivity Aramid Insulating Paper/Film for Next-Generation Electric Drive Insulation Systems** Prof. Dr. Junwen Ren Sichuan University
15:00-15:10	**Coffee Break**

15:10-15:25	**Studies on Catalytic Conversion of Energy Small Molecules Based on Polyoxometalates and Framework Materials** Prof. Dr. Zihao Xing Northeast Normal University
15:25-15:40	**Preparation of Micro-and Mesoscopic Carbon-Based Materials and Their Energy Electrochemical Performance** Prof. Dr. Junhao Zhang Jiangsu University of Science and Technology
15:40-15:55	**Defect-Engineered $NiCo_2S_{4-x}$ Nanosheets on Hollow Carbon Spheres as a Bifunctional Separator Coating for Long-Life Lithium–Sulfur Batteries** Prof. Dr. Yongzhong Wu Qilu University of Technology (Shandong Academy of Sciences)
15:55-16:05	**Natural Small-Molecule Ethyl Maltol as a Multifunctional Electrolyte Additive for Stable Zinc Anodes in Aqueous Zinc-Ion Batteries** Yuting Wu Huazhong University of Science and Technology
18:00-19:00	**Day 3 Dinner: 1F Canteen, Counters 5-8** **食堂 1 楼，5-8 窗口**

Forum 3: Optoelectronic Functional Materials and Integrated Photonics Lecture Hall (Room 467) of Building #11	
8:30-8:50	**Integrated Optical Communication and Sensing: Techniques and Applications** Prof. Dr. Chao Lv The Hong Kong Polytechnic University
8:50-9:10	**Topological-cavity surface-emitting laser** Prof. Dr. Ling Lu Institute of Physics, Chinese Academy of Sciences
9:10-9:30	**From Optoelectronic Nonlinearity to Femtojoule All-Optical Activation: 2D-Material-Integrated Silicon Photonics for Optical Computing** Prof. Dr. Hongtao Lin Zhejiang University
9:30-9:50	**Topological insulator plasmons for enhanced light-matter interactions** Prof. Dr. Hua Lu Northwestern Polytechnical University
9:50-10:10	**Zero-spacing waveguide systems and photonic parallel spaces** Prof. Dr. Yun Lai Nanjing University
10:10-10:20	**Coffee Break**
10:20-10:40	**Colloidal quantum well light-emitting diodes and their extended applications** Prof. Dr. Baiquan Liu Sun Yat-Sen University
10:40-11:00	**Micro-structured optical fiber and it's applications for UV light generation and mid-IR light delivery** Prof. Dr. Meng Pang Shanghai Institute of Optics and Fine Mechanics
11:00-11:20	**Multidimensional control of laser emission for semiconductor photonic crystal microlasers** Prof. Dr. Yongquan Zeng Wuhan University

11:20-11:40	**Hybrid integrated quantum photonics and its prospects for quantum applications** Prof. Dr. Jiaxiang Zhang Shanghai Institute of Microsystem and Information Science, Chinese Academy of Sciences
11:40-12:00	**Metasurface-enabled Multidimensional Light Field Manipulation for Advanced Imaging and Optical Information Processing** Prof. Dr. Cheng Zhang Huazhong University of Science and Technology
12:00-13:30	**Lunch** Multifunctional Hall, Second Floor of Zhushan Restaurant **珠山餐厅二楼多功能厅**
13:30-13:50	**Exploring Chiral Exceptional Lines of normal photonic crystals in the Visible Regime** Prof. Dr. Lei Shi Fudan University
13:50-14:10	**Nanostructure Lattices and Their Nanophotonic Devices** Prof. Dr. Shikai Deng Shanghai Institute of Microsystem and Information Technology, CAS
14:10-14:30	**Integrated Photonics for Distributed Coherent Radar Systems** Prof. Dr. Weifeng Zhang Beijing Institute of Technology
14:30-14:50	**High-dimensional OAM tailoring and processing** Prof. Dr. Shiyao Fu Beijing Institute of Technology
14:50-15:10	**Optical Imaging in Scattering Environments-Imaging Model and Its Limits** Prof. Dr. Yikun Liu Sun Yat-Sen University
15:10-15:20	**Coffee Break**

15:20-15:35	**Towards the Realization of Photonic Time Crystals** Prof. Dr. Xuchen Wang Harbin Engineering University
15:35-15:50	**Coherent thermal emission generation enabled by nonlocal metasurfaces** Prof. Dr. Zhanghua Han Shandong Normal University
15:50-16:05	**Contact Electrification Induced Interface Spectroscopy and the GaN Laser Diodes** Prof. Dr. Ding Li University of Chinese Academy of Sciences
16:05-16:20	**Picosecond low-threshold all-optical switching enabled by giant broadband optical nonlinearity** Prof. Dr. Zhongquan Nie National University of Defense Technology
16:20-16:35	**Nanoparticle Superlattices as Functional Materials for Programmable Nanophotonics** Prof. Dr. Shao-Ding Liu Taiyuan University of Technology
16:35-16:50	**SparseFocus: Learning-based One-shot Autofocus for Microscopy with Sparse Content** Prof. Dr. Yongping Zhai National University of Defense Technology
16:50-17:05	**Quantum-classical analogies in Floquet optical systems** Prof. Dr. Kaiyun Zhan China University of Petroleum (East China)
18:00-19:00	**Day 3 Dinner: 1F Canteen, Counters 5-8** **食堂 1 楼，5-8 窗口**

Forum 4: Multidisciplinary researches Room 452 of Building #11	
8:30-8:50	**Correlated Imaging with Multiple Optical-Field Degrees of Freedom via Nanocrystal-Material Modulation** Prof. Dr. Baoqing Sun Shandong University
8:50-9:10	**Photonic glass and applications** Prof. Dr. Dezhi Tan Zhejiang University
9:10-9:30	**Photon-Counting Micro-CT: From Spectral Imaging to Quantitative 3D Characterization of Complex Materials and Biological Systems** Prof. Dr. Tianwu Xie Fudan University
9:30-9:50	**Bioinspired Extraction of Critical Metal Resources** Prof. Dr. Jun Gao Qingdao Institute of Bioenergy and Bioprocess Technology, CAS
9:50-10:10	**Optical skyrmions in single microcavities formed by photonic spin-orbit coupling** Prof. Dr. Feng Li Xi'an Jiaotong University
10:10-10:20	**Coffee Break**
10:20-10:40	**Design and Application of Intelligent Protective Coatings for Harsh Marine Environments** Prof. Dr. Shougang Chen Ocean University of China
10:40-11:00	**Fading-Resilient and High-Sensitivity φ-OTDR Enabled by Polarization and Frequency-Domain Signal Fusion** Prof. Dr. Yang Lu China University of Petroleum (East China)
11:00-11:20	**Non contact non destructive coating thickness measurement** Dr. Rong Dong AIM Systems GmbH

11:20-11:40	**Light-field manipulation and control based on metasurfaces and metalenses** Prof. Dr. Guoxia Han China University of Petroleum (East China)
11:40-11:55	**Thermal Management Materials and Heterogeneous Integration Technologies for High-Performance GaN Semiconductor Chips** Prof. Dr. Yan Zhou Nanjing Normal University
12:00-13:30	**Lunch**
13:30-13:50	**Inorganic Functional Nanomaterials for Tumor Immunotherapy** Prof. Dr. Chunxia Li Shandong University
13:50-14:05	**Machine-learning-guided photonic-thermal co-design for passive thermal batteries** Prof. Dr. Xiawa Wang Duke Kunshan University
14:05-14:20	**Theoretical Redshift Signatures of Horizonless Compact Objects for Astrophotonic Spectroscopy** Md Imran Hossain Sakib Harbin Engineering University
14:20-14:35	**Metasurface-based multichannel Neural Network** Anna Lychagina Qingdao Innovation and Development Center, Harbin Engineering University, ITMO University
14:35-14:50	**Plasmonic Band-Edge Laser Loss Engineering and Mode Identification** Ming Zhu Harbin Engineering University
14:50-15:05	**Symmetry-engineered Ag nanoarrays for surface lattice resonance lasing** Dr. Yan Zheng Harbin Engineering University
15:05-15:25	**Polyaniline-Regulated Hollow Ceramic Microsphere-Based Core-Shell Composites for Lightweight Broadband Microwave Absorption** Prof. Dr. Qiang Wang Harbin Engineering University

Organization

- **Conference Chair**

  Prof. Dr. Wenxin Wang

- **Conference Co-Chair**

  Prof. Dr. Yong Lei Prof. Dr. Guosheng Shao

- **Conference Secretary**

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- **Conference Committee**

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Energy & Environmental Materials

《能源与环境材料（英文）》



EEM概况

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- 文章类型：研究文章、综述、评论等
- 期刊媒体：微信公众号、小红书、X (Twitter)、LinkedIn等等

稿件范围（包含但不限于以下领域）

- 光伏和光电化学
- 热电、压电和摩擦电
- 电池、燃料电池和超级电容器
- 多功能器件
- 碳捕获、储存和利用
- 环境修复、空气净化
- 净水、废水处理和海水淡化
- 生物处理

2026年
IF (2025) =13.8, JCR Q1
中科院一区

2025年
CiteScore=26.6

2024年
中国科技期刊卓越行动二期项目

2024年
双月刊，发文243篇
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2017年
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EEM

Energy & Environmental Materials



About EEM

- Organizer: Zhengzhou University
- Publishing Platform: John Wiley & Sons, Inc
- Subscription Model: Open Access
- Editor-in-Chief: Prof. Guosheng Shao & Prof. S. Ravi P. Silva
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Report Scope

Focus on but are not limited to the following areas

- Photovoltaics & photoelectrochemistry
- Thermoelectricity, piezoelectricity, and triboelectricity
- Batteries, fuel cells, and supercapacitors
- Bioprocessing
- Environmental remediation
- Clean air
- Carbon capture, storage, and utilization
- Clean water, waste water treatment, and desalination
- Devices with multifunctionality

Journal Influence (2025)

- 2025 JCR Q1
- Impact Fatcor = 13.8
- CiteScore = 26.6
- Bimonthly (228 articles in 2025)
- District 1 Chinese Academy of Sciences
- Indexed by SCIE, EI, Scopus, CSCD, etc

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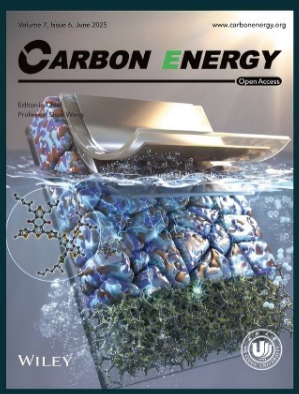
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AEFM-Wiley 2026

Introduction of Plenary and Keynote Invited Speakers



Dr. Neville Compton obtained his PhD (1989) in Chemistry from the University of Newcastle Upon Tyne, UK, and then did postdoctoral research at the University of Heidelberg in Germany. Thereafter he joined the editorial staff of Angewandte Chemie in 1992. Over the next 30 years he served as Deputy Editor and Editor-in-Chief of both Angewandte Chemie and Chemistry – A European Journal and in 2012 Neville and his team launched the new journal ChemPlusChem. Since October 2022 he is Editor-in-Chief of Small and Executive Editor for the Small family of journals. Neville has won 3 Wiley Pacesetter Awards for innovations associated with improving the publishing experience for authors.



Prof. Min Qiu is the Guoqiang Chair Professor of Optical Engineering and Vice President at Westlake University, where he also serves as the Dean of School of Engineering and the Director of Westlake Institute for Optoelectronics. He is a Foreign Member of Academia Europaea, a Foreign Member of European Academy of Sciences and Arts and a recipient of the National Science Fund for Distinguished Young Scholars. He is also a Fellow of several prestigious professional societies, including: IEEE Fellow (Institute of Electrical and Electronics Engineers), Optica Fellow (formerly OSA, The Optical Society of America), SPIE Fellow (International Society for Optical Engineering), COS Fellow (Chinese Optical Society), CSOE Fellow (Chinese Society of Optical Engineering) and CIE Fellow (Chinese Institute of Electronics). Prof. Qiu actively contributes to the academic community through leadership roles, serving as a Standing Council Member of the Chinese Society of Optical Engineering (CSOE), Deputy Director of both the Micro- and Nano-Optics Committees of CSOE and the Chinese Optical Society (COS), as well as Vice President of the Zhejiang Optical Society and the Zhejiang Institute of Electronics. Prof. Qiu's main research interest is micro-nano optoelectronics, including micro-nano fabrication technology and instrumentation, micro-nano photonics theory and optoelectronic devices, key theories and technologies for smart applications, etc.



Prof. Dr. Lan Fu is a Professor and Head of the Department of the Electronic Materials Engineering at the Research School of Physics, the Australian National University. She is a Fellow of Australian Academy of Technological Sciences & Engineering. Lan FU's main research interests include design, fabrication and integration of optoelectronic devices (LEDs, lasers, photodetectors and solar cells) and chemical sensors, based on low-dimensional III-V compound semiconductor structures including quantum wells, self-assembled quantum dots and nanowires grown by metal-organic chemical vapour deposition (MOCVD). Prof. Lan FU is the Fellow of Optica and Academician of Asia Pacific Academy of Materials (APAM). She was the recipient of the IEEE Photonics Society Graduate Student Fellowship (2000), Distinguished Lecturer Award (2021), Engineering Achievement Award (2026), Australian Research Council Postdoctoral Fellowship, ARF/QEII Fellowship and Future Fellowship. Professor FU is the current Chair of the Australian Academy of Science National Committee on Materials Science and Engineering, President of the Australian Materials Research Society, and Chair of IEEE Nanotechnology Council Chapters & Regional Activities Committee.



Prof. Dr. Yanlin Song is currently the director of the Key Laboratory of Green Printing at the Institute of Chemistry, Chinese Academy of Sciences. He has been engaged in interdisciplinary research on materials science and printing technology, and has made systematic innovative achievements in the creation of nanomaterials, interface droplet manipulation, and printing micro/nano manufacturing. He has published over 600 SCI papers, with over 66,000 citations and H-index of 126. He has been granted more than 170 Chinese and international patents.



Prof. Dr. Yalin Lu, Distinguished Chair Professor at the University of Science and Technology of China, Distinguished Researcher and Director of the Engineering-Technology Department of Hefei National Laboratory, Doctoral Supervisor, and Director of Anhui Laboratory of Advanced Photon Science and Technology. He is a Member of the Eurasian Academy of Sciences, one of the first Foreign Members of the Slovenian Academy of Engineering, recipient of the 2006 First-class National Natural Science Award of China, awardee of the first-batch National Overseas High-level Talent Introduction Program and the first-batch National Distinguished Expert in 2008, and winner of the 16th Anhui "Huangshan Friendship Award".He has published more than 550 papers in journals including “Science”, “Nature Nanotechnology”, and “PNAS”, as well as six English monographs/book chapters. He holds over 80 invention patents across China, the United States and Japan, with more than 25 additional patent applications. He has delivered over 130 plenary/invited talks at international conferences, chaired nearly 30 international conferences or symposia such as MRS meetings, and served as associate editor or editorial board member for multiple journals including “Science China Materials”. He has led 46 research projects in the United States and China, with a total research funding of nearly one billion RMB.



Prof. Dr. Haiwei Yin, B.S. from Tongji University, Ph.D. in Science from Fudan University. He is the Founder and General Manager of Shanghai Ideaoptics Corporation, and Director of Shanghai Engineering Center for Intelligent Micro-Nano Process Inspection. Ideaoptics has promoted the integration of advanced photonics technology and traditional spectroscopy, and successfully introduced artificial intelligence to build a new framework for solving optical measurement problems. Relevant achievements have been published in journals including PNAS, Light and PRL, and widely applied in semiconductor manufacturing, optical chip inspection and fabrication, biomanufacturing, quantum technology, nuclear fusion energy, advanced material research and cutting-edge scientific research. The company holds the national-level title of Specialized, Refined, Differential and Innovative "Little Giant" and is a leading optical technology enterprise in China.



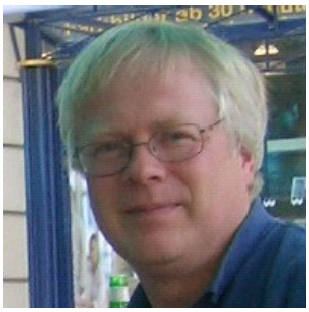
Prof. Dr. Shun Wang, National Level-2 Professor, Ph.D. Supervisor, is currently serving as the President of Lishui University. He has long been dedicated to research on advanced materials for energy storage and conversion. He has presided over 8 national-level projects, including Key and General Programs of the National Natural Science Foundation of China. He has published over 300 academic papers in high-level international journals (H-index of ~80) such as Nature Sustainability, Nature Communications, JACS, and Advanced Materials, and has been granted more than 80 invention patents in the US and China. He serves as the Director of the National Demonstration Base for Introducing Talents and Intelligence, a national candidate of the "Millions of Talents Project," a National Young and Middle-aged Expert with Outstanding Contributions, and a Fellow of the Royal Society of Chemistry. He is the Founding Editor-in-Chief of the journal Carbon Energy (IF=21.4). He is also a member of the Electrochemical Society of the Chinese Chemical Society. He has received over 10 international awards such as the IALB "Outstanding Research Award", and he has been recognized as a Highly Cited Researcher by Clarivate Analytics (2018-2025).



Prof. Dr. Shensheng Han, graduated with a bachelor's degree from the University of Science and Technology of China in 1983, and subsequently obtained a master's and a doctoral degree from the same university. He is a professor and doctoral supervisor at the Shanghai Institute of Optics and Fine Mechanics of the Chinese Academy of Sciences. He previously served as the deputy director of the Key Laboratory of Strong-Field Laser Physics of the Chinese Academy of Sciences, the director of the Key Laboratory of Quantum Optics of the Chinese Academy of Sciences, a member of the Quantum Optics Committee of the Chinese Physical Society, a member of the Council of the Chinese Optical Engineering Society, and a member of the Quantum Information Committee of the Chinese Electronics Society. His research interests in recent years have mainly focused on the imaging technique based on high-order correlation of light field (ghost imaging) and its applications.



Prof. Dr. Yonggang Zhang, recipient of the National High-Level Talent Program (Distinguished Professor). He serves as Dean of the College of Information and Communication Engineering and Executive Dean of the College of Integrated Circuits, Harbin Engineering University, and Deputy Director of the Engineering Research Center of Navigation Instruments of the Ministry of Education, as well as Director of the Chinese Society of Inertial Technology. His research focuses on navigation devices and algorithms, signal processing, and information fusion. He has presided over key projects of the National Key R&D Program of the Ministry of Science and Technology and Key Programs of the National Natural Science Foundation of China, and published more than 170 academic papers. He has won 7 provincial and ministerial-level science and technology awards, including 4 first prizes, such as the First Prize of Heilongjiang Provincial Natural Science Award (1st rank) and the First Prize of Natural Science Award of the Chinese Association of Automation (1st rank). He is the winner of the IEEE Barry Carlton Award and the Young Scientist Award of the Chinese Association of Automation. He has obtained the Second Prize of National Teaching Achievement Award and the Special Prize of Heilongjiang Provincial Teaching Achievement Award. He has been honored as Outstanding Doctoral Dissertation Supervisor by the Chinese Association of Automation and Outstanding Doctoral Dissertation Supervisor by the China Satellite Navigation and Positioning Association.



Prof. Dr. John TS Irvine is Professor of Chemistry at the University of St Andrews. He has established a significant international research grouping investigating fundamental electrochemistry, solid state chemistry and materials science addressing critical energy problems. This research is driven both by the need to solve the current environmental and energy supply problems facing mankind and an interest in new science that challenges conventional assumptions. The quality and impact of this research has been recognised by a number of national and international awards, most recently the Hughes medal from the Royal Society in 2021 and the Lord Kelvin Medal from the Royal Society of Edinburgh in 2018. He is a Fellow of both The Electrochemical Society and the Royal Society of Chemistry and a member of the Academia Europea. His impact has been recognised in the 2024 King's Birthday honours list as a Commander of the Order of the British Empire for Services to the Green Economy. Since 2012, he has published 14 Nature family papers. He has strong international standing having held senior visiting appointments in the US, Australia and Chinas.



Prof. Dr. Zhijie Wang received his B.S. degree in 2004 from Zhejiang University and Ph.D. degree in 2009 from the Institute of Semiconductors, Chinese Academy of Sciences. Then he performed his postdoctoral research at the University of Wyoming and the University of Michigan. In 2013, he worked as a senior scientist at the Ilmenau University of Technology (Germany). He is currently a full Professor in the Institute of Semiconductors, Chinese Academy of Sciences. His research interest includes energy-related devices and nano-photonics and he has published more than 140 papers in the journals like Energy Environ. Sci., Nature Communications, J. Am. Chem. Soc., Adv. Energy Mater., ACS Nano, Angew. Chemie, Nano Energy, etc.



Prof. Dr. Lingdong Sun received her PhD degree in Condensed Matter Physics from Changchun Institute of Physics, Chinese Academy of Physics. Following a postdoctoral fellowship, she joined the faculty at Peking University, and was promoted to associate professor and professor. She worked as a visiting professor at Keio University (2001) and Kyoto University (2007).Her current research focuses on the nanochemistry and photophysics of rare earth materials, semiconductors, and metal nanomaterials. She has published over 200 peer reviewed papers in Science, Nature, Nature Photonics, JACS, and ACIE, et al. with more than 10,000 citations, and has been recognized as a highly cited author.



Prof. Dr. Guanying Chen received his Ph.D. in Optics from Harbin Institute of Technology and subsequently conducted postdoctoral research at the University at Buffalo, State University of New York. His research focuses on lanthanide luminescent materials, photon upconversion, nanoscale energy transfer, and biophotonics. In recent years, his group has made significant contributions to understanding and improving the brightness of lanthanide-doped upconversion nanoparticles, particularly through studies of size-dependent energy transfer, surface quenching, concentration quenching, back energy transfer, and nanostructure engineering. His representative work has been published in journals including Nature Photonics, Nature Communications, Journal of the American Chemical Society, Chemical Reviews, and Advanced Materials.



Prof. Dr. Aoneng Cao received his B. S. in chemistry in 1989 and M. S. in material sciences in 1995 from Zhejiang University, and obtained his Ph. D. degree in chemistry in 1998 from Peking University. After two years of postdoc training at Cornell University, he joined the faculty of the College of Chemistry and Molecular Engineering at Peking University in 2000. He moved to the Institute of Nanochemistry and Nanobiology at Shanghai University in 2008, and currently, he is the director of the Institute of Nanochemistry and Nanobiology, Shanghai University. He has been working in the fields of Biophysical chemistry, Nanochemistry and Nanobiology, and has published over 100 peer-reviewed papers, and holds over 20 patents. He proposed the "Confined Lowest Energy Fragment" (CLEF) hypothesis for the protein folding problem, and has conceived the idea of molecular conformational engineering, via which a class of artificial proteins have been created.



Prof. Dr. Juntao Gao is an Associate Research Professor in Tsinghua University, China. He possesses a multidisciplinary background in Systems Biology, molecular imaging and related fields. He has long been dedicated to developing novel single cell spatial multi-omics technologies and applying these technologies to investigate the molecular mechanisms of major diseases such as cancer. Dr. Gao received his Ph.D. in Natural Sciences from the University of Heidelberg and the German Cancer Research Center in Germany in 2005. He subsequently conducted postdoctoral and visiting research at prestigious international institutions, including the Stowers Institute for Medical Research in the USA and the European Molecular Biology Laboratory in Germany, before joining Tsinghua University in 2012. His research focuses on developing intelligent imaging-based multi-omic methods, quantitatively analyzing three-dimensional genome architecture, and exploring the mechanisms of tumorigenesis.



Prof. Dr. Xiaohong Xia is a professor at Hubei University. She received her Ph.D. degree from the Huazhong Normal University in 2007. She worked at the University of Bolton as a postdoctoral research fellow in 2010–2011, and been promoted to associate professor in 2012 and then to professor in 2017. Her current research interest is design and fabrication of semiconductor materials and devices.



Prof. Dr. Wang Hai is an associate Professor at the College of Electronic Science and Engineering, College of Integrated Circuits, Jilin University. Dr Wang obtained his B.S. degree in Physics from Jilin University in China. After that, he moved to the Italian Institute of Technology in Italy and obtained his PhD degree in Nanoscience. His research focuses on strong light-matter interaction, such as strong coupling between surface plasmons and J-aggregates, semiconductor quantum dots, and perovskites. Based on these researches, functional devices capable of highly efficient energy transfer and spin manipulation under strong coupling have been realized.



Prof. Dr. Jun Wang is a professor and Ph.D. supervisor at the School of Innovation and Entrepreneurship, Southern University of Science and Technology (SUSTech). He obtained his Ph.D. in Materials Physics and Chemistry from the Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, in 2012. From September 2012 to April 2018, he worked as a researcher at the MEET Battery Research Center at the University of Münster, focusing his research on key materials and devices for rechargeable batteries. He has published over 110 SCI papers (with a total of more than 200 publications) as the first or corresponding author in prestigious journals such as Nat. Rev. Chem., Chem. Soc. Rev., Nat. Commun., Joule, Adv. Mater., Angew. Chem., and Energy Environ. Sci., accumulating over 10,000 citations. He has applied for more than 50 invention patents (including 3 PCT patents) and serves as a youth editorial board member for the journals *eScience*, *Science China Materials*, and *Energy Storage Science and Technology*. Additionally, he has presided over more than 20 research projects, including those funded by the National Natural Science Foundation of China.



Prof. Dr. Peng Gao is a professor and group leader at the Advanced Functional Materials Laboratory, Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences. He received his PhD in 2010 from the Max Planck Institute for Polymer Research and the University of Mainz under Prof. Klaus Müllen, and carried out postdoctoral research at EPFL with Prof. Michael Grätzel. His research focuses on interfacial defects and the stability of emerging photovoltaics, spanning hybrid semiconductor design, large-area perovskite modules, perovskite/silicon tandems and thermoelectric materials. He has published over 310 SCI papers with more than 51,000 citations and an H-index of 86, holds 15 invention patents, and has been listed as a Clarivate Highly Cited Researcher for eight consecutive years. He has been supported by the National Overseas High-level Talent Program, the Fujian Hundred Talents Program and the Xiamen Outstanding Young Talent award, and has led 12 research projects totaling 16 million RMB. In 2023 he founded Xiamen Zhongke Yanyang New Materials Co., Ltd.



Prof. Dr. Dangyuan Lei is Professor of Materials Science and Engineering, Professor of Physics (joint appointment) and Deputy Director of the Centre for Functional Photonics at the City University of Hong Kong, and was the Provost's Visiting Professor of Physics at Imperial College London. He carried out his PhD study and postdoctoral training under the supervision of Professor Stefan Maier - a world-renowned early pioneer in Nanophotonics and in close collaboration with Professor Sir John Pendry - father of metamaterials. His current research interest centers on quantum, nonlinear and intelligent nano-photonics as well as ultrafast spectroscopy of exciton-photon-phonon coupling in two-dimensional semiconductors, with particular interest in cavity-enhanced light-matter interaction physics and intelligent nano-devices for sensing, imaging, energy conversion and saving. He has published 290 journal papers, including 2 Nature Energy, 1 Nature Materials, 1 Nature, 1 Nature Photonics, 1 Nature Chemistry, 12 Nature Communications and 3 Science Advances etc. These publications have received 20,300 citations and an h-index of 78. He is a Fellow of SPIE, an elected member of the Hong Kong Young Academy of Sciences and a Young Member of the Hong Kong Academy of Engineering.



Prof. Dr. Bo Zhang is an Associate Professor in Institute of Electrical Engineering, Chinese Academy of Sciences, and a master's supervisor at the University of Chinese Academy of Sciences. His research interests include high-power power electronics and traction conversion and linear motor control for high-speed and ultra-high-speed maglev transportation. He has published over 30 papers and holds more than 10 authorized Chinese invention patents. He has presided over projects funded by the Young Scientists Fund and General Program of the National Natural Science Foundation of China, the Youth Innovation Promotion Association of CAS, and a major project of the Open Fund of the State Key Laboratory of High-speed Maglev Transportation Technology, and participated in the 863 Program, the 12th Five-Year National Science and Technology Support Program, and the High-Speed Maglev Key Special Projects of the 13th and 14th Five-Year National Key R&D Programs.



Prof. Dr. Xiaotao Hao is a Professor at Shandong University. He is a Fellow of the Institute of Physics and a Fellow of the Royal Society of Chemistry. He has been awarded Distinguished Taishan Scholar of Shandong Province. His research focuses on organic semiconductor physics, organic photovoltaic and photodetector devices, as well as ultrafast spectroscopy and microscopy. He has published over 300 papers in journals including Advanced Materials, Science Advances, Nature Communications and National Science Review with more than 21,000 citations and an h-index of 73. He holds 10 patents, and has delivered over 60 keynote and invited talks at domestic and international conferences. He currently serves as Regional Vice President of the Thin Films Society, Standing Director of multiple academic societies, Associate Editor of Chinese Journal of Chemistry and Editorial Board Member of ChemPhysMater. He served on organizing committees of several major international conferences and held academic positions in Shandong Physical Society. His honors include the Shandong Provincial Natural Science Award, Asia-Oceania Photochemistry Association Award, and multiple prestigious teaching awards.



Prof. Dr. Jing Ren, Doctoral Supervisor (Optical Engineering, Nuclear Science and Technology), is a council member of the Special Glass Branch of the China Silicate Society and a committee member of the Advanced Glass Branch of the China Materials Research Society. He has published over 200 academic papers in journals such as Adv. Mater., Adv. Funct. Mater., Light Sci Appl., and Laser. Photon. Rev., and has been invited to deliver academic reports more than 30 times both domestically and internationally. As the principal investigator, He has undertaken and completed over 20 projects, including key national R&D topics, National Natural Science Foundation projects, and projects entrusted by optoelectronic enterprises, and has won one first prize in the Heilongjiang Provincial Science and Technology Awards.



Prof. Dr. Peng Zhang is currently a professor in the school of materials science and engineering at Zhengzhou University. He completed postdoctoral research at Helmholtz-Zentrum Berlin, Germany in 2016. His current research interests focus on low dimensional carbon-based materials and their applications in the fields of environment remediation and energy storage. He has published more than 100 SCI papers (cited more than 10,000 times) in the above fields, H-index is 86.



Prof. Dr. Jinfa Chang is a professor and doctoral supervisor at the School of Chemistry, Northeast Normal University. He is a national high-level young talent. His research mainly focuses on the design and synthesis of highly efficient catalysts for electrocatalytic hydrogen-energy conversion, with an emphasis on fuel cells, water electrolysis, and energy storage batteries. He has published more than 90 papers in journals such as Nat. Energy, Nat. Commun., J. Am. Chem. Soc., Angew. Chem. Int. Ed., Energy Environ. Sci., and Joule, with an H-index of 42, and has been granted 15 invention patents.



Prof. Dr. Feng Liang, Professor at Kunming University of Science and Technology (KUST) and Visiting Professor at Kyushu University, Japan, serves as Deputy Division Director of the Development of Strategic Development and Discipline Construction at KUST. Ph.D. obtained from Tokyo Institute of Technology, Japan. Research interests encompass high-energy-density batteries, plasma-assisted preparation and modification of energy materials, and other emerging energy-material technologies. More than 130 papers have been published as first or corresponding author, including Nature Communications, Electrochemical Energy Reviews, Advanced Materials, Advanced Energy Materials, Materials Today, and Energy Storage Materials. Selected for Chang Jiang Scholars Program-young scholars and Funding Scheme for High-level Overseas Chinese Students' Return. Recipient of several research awards, including the China Industry-University-Research Collaboration Innovation Award and the Second Prize of the Yunnan Provincial Natural Science Award (Ranked 1st). Editorial board member for three SCI-indexed journals, including Chinese Chemical Letters, Discover Nano, and International Journal of Minerals Metallurgy and Materials.



Prof. Dr. Qionghua Jin, Professor and doctoral supervisor at the Department of Chemistry, Capital Normal University. Received her Ph.D. from the Institute of Coordination Chemistry, Nanjing University, and conducted postdoctoral research at École Polytechnique in France. She has been a visiting scholar at Carnegie Mellon University and the State University of New York at Buffalo. Her research focuses on the synthesis, luminescent properties and mechanisms, photocatalytic performance, and terahertz spectroscopy of copper(I) and rare-earth metal complexes. She has led and completed key projects funded by the National Natural Science Foundation of China and jointly supported by Beijing Municipal Education Commission and Beijing Municipal Natural Science Foundation. His research achievements have been published in high-impact international journals including Adv. Mater. ,Angew Chem. Int. Ed. , Adv. Sci.， Sci. China Chem.， Polyoxometalates, Inorg. Chem. , Chem. Comm. and Cryst. Growth & Des.



Prof. Dr. Bing Jin is a Professor at the School of Chemistry and Chemical Engineering and the Institute of Frontier Chemistry, Shandong University. His research lies at the intersection of ultrafast laser spectroscopy and terahertz technology, systematically exploring the structure–property relationships and dynamical mechanisms of advanced energy materials. One major research thrust of his group leverages advanced time-resolved diagnostics—notably femtosecond transient absorption (TA) and terahertz time-domain spectroscopy (THz-TDS)—to elucidate carrier dynamics in photocatalytic systems, while extending these high-sensitivity probes to the characterization of pharmaceutical cocrystals. In parallel, his laboratory emphasizes custom instrumentation, utilizing an in-house-developed laser ion source to investigate the reaction dynamics of gas-phase highly charged ions (HCIs).



Prof. Dr. Rui Zhou is a professor at National Key Laboratory of Optical Field Manipulation Science and Technology, Institute of Optics and Electronics, Chinese Academy of Sciences (IOE, CAS). He received his Ph.D. in Engineering from the National University of Singapore (NUS), an M.S. from North Carolina State University, and a B.Eng. from Zhejiang University, where he also studied Innovation and Entrepreneurship Management at Chu Kochen Honors College. His research focuses on advanced micro/nano-manufacturing, laser optical-field manipulation, and equipment development. Previously, he served as Deputy Director of the Engineering and Industrialization Center at the Pen-Tung Sah Institute of Micro-Nano Science and Technology, Xiamen University. He was listed among the World's Top 2% Scientists, and selected as a Royal Academy of Engineering Newton Fund Leadership Innovation Fellow, and received Silver Medal in the 2023 Global Outstanding Engineer Competition. He has published 80+ peer-reviewed papers in Opto-Electron. Adv., Adv. Opt. Mater., and Adv. Sci., etc. with 3,300+ citations, and holds nearly 30 granted patents. He is dedicated to translate micro/nano-manufacturing advances into practical engineering solutions.



Prof. Dr. Shaoyuan Li has been awarded funding from the National Natural Science Foundation of China (NSFC) Young Scientists Fund (Type B), previously known as the Excellent Young Scientists Fund. His research focuses primarily on photovoltaic silicon and energy materials. He currently serves as Director of the Yunnan Provincial University Engineering Research Center for Silicon Metallurgy and Silicon Materials and as a member of the Photovoltaics Committee of the Chinese Renewable Energy Society. He has led more than 30 national, provincial, and ministerial research projects, including projects under the National Key Research and Development Program of China, the National Natural Science Foundation of China, and the Major Science and Technology Project of Yunnan Province. He has published over 100 SCI-indexed papers in internationally renowned journals, including Energy & Environmental Science, Advanced Energy Materials, and Carbon Energy, among which 11 have been recognized as ESI Highly Cited Papers and seven as ESI Hot Papers. He currently serves as a young editorial board member for several leading academic journals, including Carbon Energy, Rare Metals, and Green Carbon.



Prof. Dr. Chao Lv obtained his BEng in Electronic Engineering from Tsinghua University, China in 1985, and his MSc and PhD from University of Manchester in 1987 and 1990 respectively. He joined the School of Electrical and Electronic Engineering, Nanyang Technological University (NTU), Singapore as a faculty member in 1991 and was there until 2006. From June 2002 to December 2005, he was seconded to the Institute for Infocomm Research, Agency for Science, Technology and Research (A*STAR), Singapore, as Program Director and Department Manager leading a research group in the area of optical communication and fibre devices. He joined the Hong Kong Polytechnic University in 2006 and is currently Chair Professor of Fibre Optics and director of the Photonics Research Institute there. His research interests are in the area of high capacity transmission techniques for long haul and short reach systems and distributed optical sensing systems. In addition to academic research work, he has had many industrial collaborative research projects and has a number of awarded patents. His current research interests are in the area of high capacity transmission techniques for long haul and short reach systems and distributed optical sensing systems. He is a fellow of the Optical Society (OPTICA/OSA).



Prof. Dr. Ling Lu is a group leader in the Institute of Physics, Chinese Academy of Sciences, Beijing China. He obtained his bachelor in Physics from Fudan University, and a Ph.D. in Electrical Engineering from University of Southern California where he worked on photonic crystal nanocavity lasers. He was a postdoc at Massachusetts Institute of Technology, where he and colleagues coined "topological photonics" and discovered "Weyl points". He was awarded the Chen Ning Yang Award by the Asian Pacific Societies, Pei Yuan Zhou Award by the Chinese Physics Society, and the Highly Cited Researchers by Clarivate Web of Science. His group is developing "hypergap" materials and two topological devices, the topological-cavity surface-emitting laser (TCSEL) and the topological microwave isolator.



Prof. Dr. Hongtao Lin is a tenured Associate Professor and Ph.D. advisor at Zhejiang University, China. His research focuses on silicon–chalcogenide heterogeneous photonic integration, programmable photonics, and emerging-material-enabled photonic devices and computing. He has led a number of research projects, including a Young Scientist Project of the National Key R&D Program of China. He has authored or co-authored more than 100 peer-reviewed papers in journals including Nature Photonics, Nature Communications, and Light: Science & Applications, with over 9,600 citations. His research has been recognized by OSA's Optic & Photonics News's Optics in 2018 selection and China's Top 10 Optical Advances in 2023, and received a nomination for the 2024 Triennial Outstanding Achievement Award in Silicon Photonics.



Prof. Dr. Hua Lu works as a professor at Northwestern Polytechnical University in China. He achieved PhD degree at the Chinese Academy of Sciences in 2014. After this, he worked as postdoctoral fellow at Centre for Micro-Photonics in Swinburne University of Technology. In December 2015, he was appointed as associate professor at Northwestern Polytechnical University and awas promoted to professor in October 2021. His current research interest is focused on nanophotonics, nanomaterial photonics and plasmonics. Until now, he has published more than 100 peer-reviewed articles in professional journals (e.g. Light: Sciences & Applications, Advanced Photonics, and Advanced Functional Materials) with citation counts of >7600. Until now, he has awarded 4 funding projects from National Natural Science Foundation of China and Youth A Project in Shaanxi Province. In recent 5 years, He was recognized as most highly cited scientists in China. He has given more than 20 talks in the professional conferences as invited speakers as well as invited as regular reviewer for more than 40 international journals.



Prof. Dr. Yun Lai obtained his PhD degree from Hong Kong University of Science and Technology in 2005. He is currently a Professor in the School of Physics in Nanjing University. His research interests include optical, electromagnetic and acoustic metamaterials, metasurfaces, nanophotonics and plasmonics, photonic and phononic crystals, etc. Prof. LAI has published more than 180 papers on SCI journals including Science, Nature, Nature Materials, Physical Review Letters/X, Nature Communications and Science Advances, with the total citation number exceeding 10000 and an H-index of 46. He has pioneered some key concepts and theories like illusion optics, double-zero media, elastic metamaterials, transparent matte surfaces, anomalous Brewster effect and photonic parallel spaces.



Prof. Dr. Baiquan Liu received the Ph.D. degree from Materials Physics and Chemistry at South China University of Technology in 2016. From 2016 to 2020, he worked at Nanyang Technological University as a Research Fellow. In 2020, he joined Sun Yat-sen University as a faculty member and currently is an Associate Professor at the School of Electronics and Information Technology/State Key Laboratory of Optoelectronic Materials and Technologies. His current scientific interest is focused on the physics and chemistry of semiconductor optoelectronic devices (e.g., light-emitting diodes, photodetectors, solar cells, and thin film transistors) and their integrations.



Prof. Dr. Yongquan Zeng works as a professor at Electronic Information School, Wuhan University. He graduated with a bachelor's degree from the Department of Materials Physics at the University of Science and Technology of China, and obtained his doctoral degree from School of Electrical and Electronic Engineering at Nanyang Technological University in Singapore. He has been engaged in the research of novel semiconductor lasers for more than 12 years, accumulating rich research experience in the functional design of semiconductor lasers, optimization of photonic structures, experimental preparation and performance characterization. He has led and participated in several scientific research projects, including the National Key Research and Development Program, the National Natural Science Foundation of China, and the Innovation Program of Hubei Province. Currently, he has published over 20 first-/corresponding-author papers in leading journals, including Nature, Nature Communications, Science Advances, Light: Science & Applications, Nano Letters, and ACS Photonics, and contributed to two Science papers. He has also filed 15 patents, with two granted, and delivered over 20 invited conference presentations.



Prof. Dr. Meng Pang got his Ph. D degree in Hong Kong Polytechnic University in 2011. After that, he worked in Ottawa University (Canada) and Max-Plank Institute for Science of Light (MPL, Germany) from 2011 to 2015 with postdoc positions. From 2015 to 2019, he worked as a group lead in Russell division at MPL. Then, he jointed Shanghai Institute of Optics and Fine Mechanics (CAS, China) as a seminar researcher and a professor. Prof. Pang's research topics include micro-structured optical fiber, ultrafast fiber laser and nonlinear fiber optics. In this area, he has published more than 80 papers, including Nature Photonics, Nature Communications, Light, Optica and Laser & Photonics Reviews. He was granted the Youth Fund A of National Science Foundation and Nation Young Talent project.



Prof. Dr. Jiaxiang Zhang is a Professor at the Shanghai Institute of Microsystem and Information Technology (SIMIT), Chinese Academy of Sciences (CAS). He received his Ph.D. from the Leibniz Institute for Solid State and Materials Research Dresden (IFW Dresden), Germany, in August 2015. From September 2015 to March 2018, he conducted research at IFW Dresden and the Munich Center for Quantum Science and Technology (MCQ) at Ludwig Maximilian University of Munich (LMU Munich). In 2018, he was selected for the 15th cohort of China's national high-level young talent program. His research focuses on heterogeneous material integration, cryogenic hybrid-integrated optoelectronic devices, and photonic chips. He has addressed a range of fundamental physical and technological challenges in translating emerging materials into high-performance nonlinear photonic and quantum photonic technologies. His research has led to the realization of the largest-scale hybrid-integrated quantum-dot photonic quantum chip to date, featuring 20 channels of deterministic single-photon sources, as well as the first on-chip coherent interconnection of distinct deterministic quantum light sources. To date, he has published more than 80 SCI-indexed papers in leading journals, including Nature Materials, Nature Nanotechnology, and Nature Physics, and has filed or been granted more than 10 Chinese invention patents. He has also led and participated in major research projects, including projects under China's National Key R&D Program and the CAS Stable Support Program for Young Research Teams.



Prof. Dr. Cheng Zhang is a professor at School of Optical and Electronic Information & Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology. He obtained his BS degree in electrical science and technology from Shandong University, China, in 2010, and his PhD in electrical engineering from the University of Michigan-Ann Arbor, United States, in 2016. He currently leads a research team working on cutting-edge projects aimed at the exploitation of nanophotonic materials, devices and fabrication techniques for novel imaging and displaying applications (https://light.hust.edu.cn). He has published 71 research papers with more than 8,000 citations and an H-index of 45, and delivered over 50 invited talks at international conferences.



Prof. Dr. Lei Shi. A professor in the Department of Physics at Fudan University since December 2013. His research focuses on light field manipulation in photonic crystals and optical metrology for micro/nano fabrication. He has published more than 80 academic papers as first author or corresponding author in journals including Nature, Nature Photonics, Nature Communications, Physical Review Letters, PNAS, Advanced Materials, Light: Science & Applications, Science Bulletin, ACS Nano, and Nano Letters. He has been granted 9 invention patents and has developed momentum-space imaging spectroscopy equipment that has been industrialized and applied. He has received the Outstanding Individual Award of the 11th Golden Bridge Award of the China Technology Market Association, the 2022 China Industry-University-Research Cooperation Innovation and Promotion Award (Individual), and the First Prize of the Shanghai Natural Science Award in 2023 (second contributor).



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Prof. Dr. Shiyao Fu is currently a professor in Beijing Institute of Technology. His research interests including advanced solid-state lasers, laser field manipulation, and their applications. In the past five years, he has led over ten research projects including the National Key Research and Development Program, the National Natural Science Foundation (original exploration program and its continuation funding, etc.), the Beijing Outstanding Young Scientists Foundation Project. He has published 58 peer-reviewed papers as the first or corresponding author in top journals such as Nature Communications and Light: Science & Applications, and has been granted 27 Chinese invention patents and authored two monographs. His research achievements won the Second Prize of the Beijing Natural Science Award (2022). Currently, he is a member of the laser committee of the Chinese Optical Society (COS) and Senior Members of both Optica and COS. He received the Excellent Doctoral Dissertation Award from the Chinese Institute of Electronics in 2020, and was selected as a Youth Chang-Jiang Scholar in 2023.



Prof. Dr. Yikun Liu is an associate professor at the School of Physics and Astronomy, Sun Yat-sen University. His research primarily focuses on the principles and technologies of optical imaging in low-visibility atmospheric and underwater environments.



Prof. Dr. Baoqing Sun received his PhD degree in Physics from University of Glasgow. He is a professor at Shandong University. He now leads a research group of about 20 people including postgraduate students. His research interests include but not limited in computational imaging, quantum imaging and novel imaging technologies. He publishes more than 30 papers in related area. He is also members of several national academic committee.



Prof. Dr. Dezhi Tan. Professor at Zhejiang University, recipient of national-level high-ranking young talent program. Awarded multiple honors including top 10 Chinese scientific advance, the top 10 Chinese optical advances, and the Youth Science and Technology Award from the Chinese Ceramic Society. Published over 60 first/corresponding-author papers in high-impact journals such as Science, Science Advances, Nature Communications.



Prof. Dr. Tianwu Xie is a Principal Investigator at Fudan University, China. He received his Ph.D. degree in Biomedical Engineering from Huazhong University of Science and Technology and previously conducted postdoctoral research at Geneva University Hospitals, Switzerland. His research focuses on medical physics, biomedical imaging, radiation dosimetry, and human digital twin technologies. He has extensive experience in Monte Carlo simulation, molecular imaging, and advanced CT imaging technologies. His current research interests include photon-counting CT, quantitative biomedical imaging, and computational modeling for personalized medicine.Dr. Xie has published more than 30 peer-reviewed scientific papers and serves as a member of several professional organizations, including EURADOS and SNMMI. His research aims to develop innovative imaging and computational approaches for understanding biological systems and improving precision medicine.



Prof. Dr. Feng Li got his bachelor's and master's degree at Tianjin University in China in 2006 and 2008. He got his PhD at CNRS and the University of Nice Sophia Antipolis in France in 2013, supported by the European Marie Curie ITN project CLERMONT4. Then he worked as a research associate at the University of Sheffield in UK from January 2014 to May 2017. Feng Li joined Xi'an Jiaotong University (China) as a professor in June 2017, with main research interest in light-matter interaction in microcavities and micro/nanostructures.



Prof. Dr. Jun Gao is a professor at the Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences. He received his Ph.D. in physical chemistry from the Institute of Chemistry, Chinese Academy of Sciences, in 2014. His research focuses on biomimetic ion-transport materials and energy applications, including biomimetic ion channels for energy-positive wastewater treatment, lithium extraction, and enhanced oil recovery. By connecting the molecular mechanisms of biological ion channels with scalable membrane interfaces, his work seeks to improve the selectivity, efficiency, and environmental performance of ion separation. His current efforts emphasize the construction and regulation of channel-inspired interfaces and the mechanistic understanding required to translate selective ion transport into practical technologies for resource, energy, and environmental applications. Over the past five years, he has published over 40 papers in journals including Nature Nanotechnology, Nature Communications, Journal of the American Chemical Society, and Angewandte Chemie. He has led National Key R&D Program subproject, NSFC general projects, CAS high-level talent project, Taishan Distinguished Scholar and Dinsinguished Young Scholar projects, and Shandong Outstanding Young Scientists Fund project.



Prof. Dr. Yang Lu, Associate Professor, and Ph.D. Supervisor, Vice Dean of the School of Control Science and Engineering at China University of Petroleum (East China). He is a recipient of the Young Elite Scientists Sponsorship Program of the China Association for Science and Technology (CAST). His research interests include femtosecond-laser ultrafast imaging, optical 3D scanning and measurement, flow cytometry imaging and detection, and distributed optical fiber sensing. He has led eight national and provincial research projects, including a General Program and a Young Scientists Fund project of the National Natural Science Foundation of China (NSFC), two subprojects of the National Key Research and Development Program of China, and a major innovation project of Shandong Province. He has published more than 30 papers in optical precision measurement and sensing and holds over 40 patents.



Prof. Dr. Shougang Chen, he currently serves as Deputy Director of the Shandong Key Laboratory of Marine Equipment Materials and Protection, and Director of the Qingdao Key Laboratory of Marine Equipment Corrosion and Protection. His research focuses on marine critical materials and the application of their special protective coatings，mainly cover photoelectrocatalytic antifouling materials, self-healing anticorrosion materials, multi-field coupled corrosion of materials, and special functional coatings.He has published more than 200 SCI papers in domestic and international journals such as Angewandte Chemie, Advanced Functional Materials, Applied Catalysis B, Nano Energy, Chemical Engineering Journal, Corrosion Science, and Biosensors and Bioelectronics. As the first completer,he has received many research awards including the Second Prize of the Ministry of Education Technical Invention Award, the Second Prize of the Ministry of Education Natural Science Award, the First Prize of the State Oceanic Administration Innovation Achievement Award, the First Prize of Qingdao Science and Technology Progress Award, and the Second Prize of the Shandong Military-Civil Integration Advanced Technology Innovation Competition. He is an editorial board member of the international journals Advanced Composites and Hybrid Materials and Surface Science and Technology.



Prof. Dr. Rong Dong, expert with more than 20 years successful experience in R&D of optical technology for non-contact and non-destructive measurement and detection. She is now the general manager of AIM Systems for Great China region. AIM Systems GmbH is an ISO 9001 certified German company and an active and innovative technology leader of automated coating inspection systems. With its patented non-contact, non-destructive coating thickness measurement technology, AIM Systems has successfully helped their customers worldwide to reach the goal of quality improvement and cost reduction in the coating process. In 2023, due to the distinguished innovation of coating thickness measurement, AIM Systems was awarded by AMA Association for Sensors and Measurement as the winner of AMA.



Prof. Dr. Guoxia Han, Ph.D., is an associate professor in the School of Science at China University of Petroleum (East China). She received her Ph.D. in Optics from Xidian University in 2009 and joined the School of Science at China University of Petroleum (East China) that same year. From 2015 to 2017, she conducted postdoctoral research in the group led by Professor Yao Baoli at the Xi'an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences. Her primary research interests include light field manipulation, light-matter interactions, and metasurfaces and metaslenses. She has published more than 30 academic papers in various international journals and serves as a reviewer for several international academic journals.



Prof. Dr. Chunxia Li received her B.S. (2002) and M.S. (2005) in chemistry from Northeast Normal University, and a Ph.D. degree (2008) from Changchun Institute of Applied Chemistry, Chinese Academy of Sciences. Her current research interests include the controllable synthesis of multifunctional nanomaterials and their bio-application. She was selected in Thomson Reuters (Clarivate) Highly Cited Researchers for 5 times and Elsevier China's Highly Cited Scholars in 2015-2025. So far, she has published more than 200 peer-reviewed journal articles, such as Chem. Soc. Rev., Adv. Mater., Angew. Chem. Int. Ed. etc., and these articles have totally been cited over 27,000 times by others with a personal H index of 94 (Web of Science).



Prof. Dr. Qiang Wang is an Associate Professor at the School of Materials Science and Chemical Engineering, Harbin Engineering University. His research focuses on polymer-based electromagnetic functional materials and coatings for marine applications. He has led more than ten government-funded research projects, including field foundation,rapid-support,common-technology,fundamental innovation, supporting, national key laboratory, and Fundamental Research Funds projects, as well as more than 80 industry-sponsored projects. He has also participated in over 100 additional research projects. He has contributed to the development and industrialization of lightweight pressure-resistant filling materials and multiscale electromagnetic materials, which have been applied in multiple types of marine equipment. He has published more than 50 SCI-indexed papers in journals including Chemical Engineering Journal, Ceramics International, obtained over 20 authorized invention patents, and participated in the formulation of one national standard. He has received a Shandong Provincial Graduate Quality Course award and a patent excellence award from the shipbuilding industry. He has supervised more than 20 master's and doctoral students and guided student teams to win over 10 competition awards, including the national championship of the 4th China Graduate "Dual Carbon" Innovation and Creativity Competition.



Prof. Dr. Fulai Zhao is a professor and doctoral supervisor. He was awarded the Shandong Provincial "Taishan Scholars Youth Expert" and selected for the Young Talent Support Project of the China Association for Science and Technology. He is the technical lead of the Shandong Provincial University Future Industry Engineering Research Center, and a science-and-technology evaluation expert for Shandong Province and Lianyungang City. Additionally, he serves as a committee member of both the Thermal Conductive Composites Branch and the Nanocomposites Branch of the Chinese Composites Society. His research interests lie in nanocomposites, optoelectronic devices, photothermal conversion, and electrochemical energy storage. He has chaired 8 national- and provincial-level projects as well as 5 horizontal and institutional projects, and participated in 9 national research programs. He has authored more than 50 journal publications (Nat. Commun., Carbon Energy, InfoMat, etc.) and holds 22 authorized invention patents. He acts as a youth editorial-board member for journals including Energy & Environmental Materials, Research, and Microstructures, and reviews manuscripts for over 40 SCI-indexed journals.



Prof. Dr. Siyu Lu is a professor and doctoral supervisor at Zhengzhou University, and a leading researcher in basic research in the Central Plains region. His research primarily focuses on the controlled synthesis of carbon dots and their functional exploration in luminescence, catalysis, and related fields. He has presided over multiple research projects, including the Excellent Young Scientists Fund, Regional Joint Key Project of the National Natural Science Foundation of China, Outstanding Innovation Group Program of Henan Province, General Program, and Youth Program. He has published more than 200 academic papers in journals such as Nat. Synth., J. Am. Chem. Soc., Adv. Mater., Angew. Chem. Int. Ed., and Nat. Commun., with the total citations exceeding 37,000 and an H-index of 108. Dr. Lu serves as Associate Editor of Chin. J. Chem. (CAS Q1), Editorial Board Member of Chinese Chem. Lett., and Young Editorial Board Member of Sci. Bull. and Sci. China Chem.. He was named a Clarivate Highly Cited Researcher (2022) and an Elsevier China Highly Cited Scholar (2023). Additionally, he holds the positions of Council Member of the Carbon Dot Functional Materials Council and Co-Chair of the National Conference on Carbon Dot Functional Materials.



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Prof. Dr. Shuoqing Zhao is currently a Professor and Ph.D. supervisor at the School of Physics, Jilin University, where he conducts research at the MOE Key Laboratory of New Battery Physics and Technology. He received his Ph.D. degree from the University of Technology Sydney in November 2021 under the supervision of Prof. Guoxiu Wang, an Academician of the Australian Academy of Science. He subsequently pursued postdoctoral research at the School of Materials Science and Engineering, Peking University, under the guidance of Prof. Shaojun Guo. Dr. Zhao has been dedicated to the high-value utilization of alkali-metal resources from salt lakes and the development of advanced energy storage technologies. Over the past five years, he has published 28 SCI-indexed papers as the first author or corresponding author in prestigious journals, including Journal of the American Chemical Society, Advanced Materials, Angewandte Chemie International Edition, Joule, and Energy & Environmental Science. He has led several competitive research projects, including grants from the National Natural Science Foundation of China (General Program and Young Scientists Fund), subprojects of the National Key Research and Development Program of China, and the China Postdoctoral Science Foundation.



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Prof. Dr. Su Zhang is affiliated with China University of Petroleum (East China) and is a recipient of the Taishan Young Scholar Program of Shandong Province. His research focuses on the structural design and controllable synthesis of advanced carbon materials, as well as their fundamental and applied studies in electrochemical energy-storage systems, including supercapacitors and lithium-/sodium-ion batteries. He has served as the principal investigator of several research projects, including grants from the National Natural Science Foundation of China. He has published more than 90 peer-reviewed papers in journals such as Advanced Energy Materials, Advanced Functional Materials, Nano Energy, Energy Storage Materials, Journal of Materials Chemistry A, and Carbon. Among these publications, 11 have been recognized as ESI Highly Cited Papers. His publications have received more than 5,000 citations. His current research interests center on rational pore-structure engineering, ion-transport regulation, and high-performance carbon electrodes for practical electrochemical energy storage.



Prof. Dr. Zhiqin Ying is an Associate Researcher and Master's Supervisor. Her research has long centered on perovskite-based tandem solar cells. She has published more than 60 academic papers, with over 30 as first author or corresponding author in journals such as Nature Energy, Nature Communications, Joule, Energy & Environmental Science, and Advanced Materials. She has co-authored a monograph and filed or received more than 20 Chinese invention patents. She has led over 10 projects, including general and youth programs funded by the National Natural Science Foundation of China, as well as provincial, ministerial, and industry-sponsored projects. She was selected for the Chinese Academy of Sciences "Hundred Talents Program" and the Ningbo Youth Leading Talent Program. She also reviews independently for journals such as Nature, Nature Communications, and Advanced Materials.



Prof. Dr. Anjun Hu, Associate Professor and Master's Supervisor at Chengdu University of Technology. His research focuses on technological breakthroughs, product development, and application research of key materials for advanced power and energy storage batteries. He has led the Youth Program of the National Natural Science Foundation of China and the Youth Program of the Natural Science Foundation of Sichuan Province. As first or corresponding author, he has published more than 100 SCI-indexed papers in journals such as Energy & Environmental Science, Angewandte Chemie International Edition, and Advanced Materials, with over 6,000 total citations and an H-index of 41. He holds more than 20 authorized national invention patents. He currently serves as a Young Editorial Board Member for journals including SusMat, Carbon Energy, and Carbon Neutralization, and as a reviewer for journals such as Advanced Materials and Angewandte Chemie International Edition.



Prof. Dr. Shuhua Wang is a professor and doctoral supervisor at the State Key Laboratory of Crystal Materials, Shandong University. Her research mainly focuses on rechargeable secondary batteries, including lithium metal batteries and aqueous zinc batteries. As the principal investigator, she has undertaken several research projects, including the National Natural Science Foundation of China (NSFC) Major Research Program (Cultivation Project), General Program, and Young Scientists Fund, as well as the China Association for Science and Technology (CAST) Young Talent Support Project, and the Shandong Provincial Excellent Young Scientist Fund. In recent years, she has published more than 40 research papers as the first or corresponding author in internationally renowned journals, including Nature Communications, Advanced Materials, Energy & Environmental Science, and Advanced Energy Materials.



Prof. Dr. Haonan Shi, male, born in 1997, is the professor in the School of Materials Science and Engineering, Taiyuan University of Science and Technology. His research centers on thermoelectric materials and decive, additive manufacturing of thermoelectric materials. He has published a total of 34 high-quality papers so far, among which 10 were published as the first or corresponding author. The total citations reach over 1,500 times, and his H-index is 23. He obtained the bachelor degree from Central South University in 2019 and the doctoral degree from Beihang University in 2025. He has led two NSFC-funded projects, one open project under a National Key Laboratory, one provincial-level research project in Shanxi, and one university-level project at Taiyuan University of Science and Technology. His personal webpage is available at https://cl.tyust.edu.cn/info/1198/3161.htm.



Prof. Dr. Zhihao Zhao received his Ph.D. degree from Tianjin University in 2018. He then conducted postdoctoral research at the School of Materials Science, Sun Yat-sen University. In 2021, he joined the Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, where he currently serves as an Associate Professor. His research focuses on the design of dielectric materials and nanoenergy devices. He has published multiple papers as first and/or corresponding author in leading journals, including Nature Communications, Advanced Materials, Advanced Energy Materials, and Energy & Environmental Science. His publications have received more than 9000 citations, with seven papers recognized as ESI Highly Cited Papers, and he has an h-index of 50. He has served as principal investigator for several research projects, including the National Natural Science Foundation of China, Beijing Natural Science Foundation. He has also been included in the Elsevier-Stanford University World's Top 2% Scientists list.



Prof. Dr. Kai Zeng is currently working as an associate professor at the Institute of Smart City and Intelligent Transportation, Southwest Jiaotong University. He received his Ph.D. degree in new energy science and engineering from Soochow University in 2022 and subsequently conducted postdoctoral research at Nanjing University. His research interests focus on the design, fabrication and application of advanced electrocatalysts for water electrolysis, metal-air batteries and fuel cells, etc. He was selected as a J. Mater. Chem. A Emerging Investigator (2025) by the Royal Society of Chemistry.



Prof. Dr. Zhao Cai gained his B.S. degree and Ph.D in Chemistry from Beijing University of Chemical Technology in 2012 and 2018, respectively. After working as a visiting scholar at Yale University and postdoctoral researcher at Huazhong University of Science and Technology, he joined China University of Geosciences as a Professor of Chemistry in 2022. His research focuses on developing novel transition metal nanostructures for key energy conversion and storage processes, such as aqueous batteries and electrocatalysis. To date, he has published more than 60 research papers, over one-fifth of which are ESI highly cited papers, with more than 9,000 citations and an H-index of 51. He has been ranked as the World's Top 2% Scientists by Stanford University, and received the Outstanding Paper Award from journals including Nano Research and Science Bulletin, the Outstanding Young Editorial Member Award from journals including Nano Materials Science and Carbon Future, and the Outstanding Reviewer Award from journals such as eScience.



Prof. Dr. Yibo He is a tenured associate professor and doctoral supervisor at the School of Materials Science and Engineering, Northwestern Polytechnical University. She was awarded the Young-Talent Program of Shaanxi High-Level Talent Introduction Plan. She received her Ph.D. degree from the University of Tsukuba and the National Institute of Advanced Industrial Science and Technology (AIST), Japan. Her research activities mainly concentrate on the design of functional nanomaterials, surface and interface regulation, as well as high-efficiency electrochemical energy-storage devices. Her primary research focus lies in photo-assisted lithium-sulfur batteries, lithium-metal batteries and multi-external-field synergistic electrocatalysis. She has published more than 40 SCI papers as first or corresponding author in Nature communications, Angewandte Chemie International Edition, Advanced Energy Materials, Energy & Environmental Science and other well-known journals, accumulating over 4000 citations. She has undertaken a series of research projects including the National Natural Science Foundation of China. Moreover, she works as a youth editorial board member for several international energy-chemistry journals.



Prof. Dr. Zhifeng Wang, male, born in December 1982, holds a Ph.D. and previously worked at the Korea Institute of Materials Science (KIMS). He is currently a full Professor and Doctoral Supervisor at Hebei University of Technology, and was selected for the first cohort of the "Yuanguang Scholar" Program at the university. His research focuses on nanoporous energy materials. He has published more than 160 SCI-indexed papers with a personal H-index of 38, and has been continuously included in the “Annual Scientific Impact Ranking” of the world’s top 2% scientists since 2021. He has completed three patent commercialization projects and received four provincial-level science and technology awards. In addition, he serves as a member of the editorial board or young editorial board for more than ten international academic journals, and has been appointed as a review expert for natural science foundations, science and technology programs, and science and technology awards in multiple provinces and cities.



Prof. Dr. Kangzhe Cao is an Associated Professor at Xinyang Normal University and Director of the Xinyang Key Laboratory of Low-Carbon Energy Materials. He earned his B.S. degree in Chemistry (2012) from Henan Normal University and Ph.D. degree (2017) from the College of Chemistry at Nankai University before joining Xinyang Normal University. Supported by the CSC, he studied at the Technische Universität Ilmenau (Germany) as a visiting scholar from 2023 to 2024. His research interests include energy conversion and storages (Li/Na/K-ion batteries, supercapacitors) and SERS substrates for electrochemical analysis.



Prof. Dr. Yingying Zhao, born in July 1992, is an Associate Professor and Doctoral Supervisor with a PhD degree. She has studied and worked at the College of Physics, Jilin University, the College of Physics and Optoelectronic Engineering, Harbin Engineering University, and conducted research visit at the Institute of Functional Intelligent Materials, National University of Singapore. Since 2014, she has been devoted to fundamental research on energy storage materials and devices. Targeting the coordinated regulation of "structure-property-application", she combines theoretical calculations, multi-physics simulations and advanced experimental techniques to investigate theoretical design, controllable fabrication of battery materials, and correlations between microstructure, material properties and device performance, promoting their applications in new rechargeable batteries. She has published over 40 original papers in high-impact journals including Adv. Mater. (1), Angew. Chem. Int. Ed. (3), Adv. Energy Mater. (1), Adv. Funct. Mater. (1), Energy Storage Mater. (3). She holds 6 invention patents (3 granted) and serves as principal investigator for more than 10 projects such as the National Natural Science Foundation of China (Young Scientists Fund), Heilongjiang Provincial Natural Science Foundation and China Postdoctoral Science Foundation.



Prof. Dr. Fei Wang, a professor at Kunming University of Science and Technology (School of Materials Science and Engineering), has received support from the "Yunnan Province Xingdian Talents" talent program. His research focuses mainly on lithium-ion battery anode materials, electrocatalysts, and first-principles (DFT) calculations, and the corresponding works are published in Adv. Mater., J. Am. Chem. Soc., Energy Environ. Sci., Energy Environ. Mater., eScience, ACS Energy Lett. and et al, which are over 90 papers.



Prof. Dr. Junwen Ren received his B.S. degree in Applied Chemistry (2010), M.S. degree in Polymer Chemistry and Physics (2012), and Ph.D. degree in Electrical Engineering (2017) from Xi'an Jiaotong University. In 2018, he joined the College of Electrical Engineering at Sichuan University, where he currently serves as an Associate Research Fellow. His research focuses on the field of electrical materials and equipment, with particular emphasis on the development of novel functional dielectric materials and the exploration of their applications in energy and power equipment, as well as on frontier advances in electromagnetic wave absorption and electromagnetic shielding. As a Principal Investigator (PI), Dr. Ren has led more than 20 research projects, including tasks under the National Science and Technology Major Project 2030. He has published over 40 SCI-indexed papers and holds 28 granted Chinese and U.S. patents as the first inventor. In addition to his research, he has contributed to the formulation of IEC and IEEE international standards, as well as several national standards. He also serves as a committee member for several academic organizations and as an editorial board member for various scholarly journals.



Prof. Dr. Zihao Xing, Associate Professor and Doctoral Supervisor at the College of Chemistry, Northeast Normal University, holds a Doctor of Science degree and is recognized as a High-Level Talent of Jilin Province. His research focuses on the rational design and controllable synthesis of low-cost and high-efficiency catalysts for hydrogen/oxygen electrochemical energy conversion and low-carbon small molecule transformation. He has published more than 40 papers as the first or corresponding author in top international journals including J. Am. Chem. Soc., Angew. Chem. Int. Ed., Advanced Materials and Advanced Energy Materials, with an H-index of 18 (Google Scholar). He received awards including 2025 JMCA Emerging Investigator, Gold Award of NRE Rising Star, and China Energy Catalysis Young Scholar Award. He serves as youth editorial board member for several CAS Zone-1 journals such as eScience, Carbon Neutralization and Nano Research Energy. He has hosted six research projects including the General and Youth Programs of the National Natural Science Foundation of China and Natural Science Foundation of Jilin Province. He has been invited to deliver more than 20 presentations at domestic academic conferences in electrochemistry.



Prof. Dr. Yongzhong Wu, male, is a Professor at the School of Materials Science and Engineering, Qilu University of Technology (Shandong Academy of Sciences). He obtained his B.Eng. in Polymer Materials, M.S. in Polymer Chemistry and Physics and Ph.D. in Materials Science and Engineering from Shandong institutions. He worked at the Institute of Crystal Materials, Shandong University from 2002 to 2020, researching nanomaterial preparation. His current research focuses on energy conversion and storage based on semiconductor nanomaterials.



Prof. Dr. Junhao Zhang, Doctoral Supervisor, Marie Curie Fellow, and Vice Dean of the School of Environmental and Chemical Engineering, Jiangsu University of Science and Technology. He was selected as a candidate for Outstanding Young Backbone Teachers of Jiangsu Provincial "Qinglan Project" in 2016. In 2018, he was recruited as a Tier-1 Young Scholar under the "Deep Blue Project" at Jiangsu University of Science and Technology. He served as Youth Editorial Board Member of Int. J. Min. Metal. Mater. from 2022 to 2024. He has been listed in the World's Top 2% Scientists (2022–2025), including the Lifetime Scientific Impact Ranking in 2025. He received the Third Prize of Science and Technology from China Petroleum and Chemical Industry Federation. He presides over completed and ongoing research projects, including General Program of National Natural Science Foundation of China, EU Marie Skłodowska-Curie Joint Fund, General Program of Jiangsu Natural Science Foundation, China Postdoctoral Science Foundation, Jiangsu Industry–University–Research Cooperation Project, and Zhenjiang Special Project for Carbon Peaking and Carbon Neutrality: Forward-looking Industrial and Generic Key Technology Research. He holds 16 authorized Chinese invention patents and 6 overseas invention patents in the United States, Japan and other countries. In recent years, he has published more than 100 papers as the first or corresponding author in journals such as Adv. Mater., Angew. Chem. Int. Ed., ACS Energy Lett. and Sci. Bull., among which 11 are Highly Cited Papers.



Prof. Dr. Sergey Makarov is a Professor of Harbin Engineering University (HEU) serving also as an International Director of METANANO Center at Qingdao Campus of HEU. He also serves as a Director of Photonic Institute at ITMO University. He is a winer of National Talents Program and Russian Presidential Award, as well as a co-author of more than 400 publications and more than 20 patents on the topic of nanophotonics, integrated optics, and halide perovskite optoelectronics. He is a member of Editorial Board of various international journals as Interdisciplinary Materials (Wiley) and Opto-Electronic Advances.



Prof. Dr. Xuchen Wang is a Professor and PhD supervisor at the College of Physics and Optoelectronic Engineering, Harbin Engineering University. He received his Ph.D. in Electronics and Nanotechnology from Aalto University, Finland, in 2020, where his research focused on time- and space-varying electromagnetic surfaces. He subsequently conducted postdoctoral research at Aalto University and Karlsruhe Institute of Technology, Germany. His research interests include time-varying electromagnetics, metamaterials and metasurfaces, photonic time crystals, nonreciprocal wave control, and electromagnetic wave manipulation. He has published around 30 journal papers, including works in Nature Photonics, Science Advances, Physical Review Letters, Physical Review Applied, IEEE Transactions on Antennas and Propagation, IEEE Transactions on Microwave Theory and Techniques, ACS Photonics, and Nanophotonics. He has also authored a book chapter, holds several patents, and has delivered more than 20 invited talks. He was selected for the National Excellent Young Scientists Fund (Overseas) and received the Aalto University Outstanding Doctoral Dissertation Award.



Prof. Dr. Zhanghua Han is a Professor of Physics at Shandong Normal University, China, and he has long been dedicated to the research of high-Q resonance physical mechanisms and their applications in nonlocal metasurfaces. Over the past three years, with a focus on frontier directions such as high-Q modes and photonic flatbands in nonlocal metasurfaces, he has achieved a series of original, internationally impactful outcomes. His work has been widely published in prominent journals, including Nature Communications (4 papers), Science Advances, Advanced Photonics, Opto-Electronic Advances, Laser & Photonics Reviews, and Nano Letters.



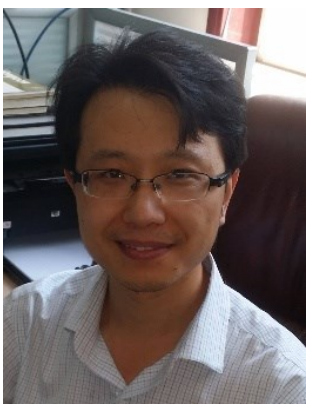
Prof. Dr. Ding Li is a doctoral supervisor and Associate Professor at the University of Chinese Academy of Sciences as well as at Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences. He has conducted in-depth research on the key fundamental scientific and technological issues that have become "bottlenecks" restricting the development of third-generation semiconductor. He has achieved a series of original innovations and industrial application results in the growth and physical mechanisms of GaN-based semiconductor devices, Contact Electrification Induced Interface Spectroscopy (CEIIS), and Piezo-phototronics. The related results have been published in more than 50 SCI papers in journals such as Science Advances, Adv. Funct. Mater., and Nano Energy. His epitaxial GaN laser devices have achieved room-temperature pulsed output power exceeding 5 W under electrical injection (with uncoated cavity facets), reaching a world-class level. He has presented papers at multiple international academic conferences on semiconductor research in the United States, Japan, the United Kingdom, China, and other countries. As an inventor, he has granted 7 invention patents. These patents have been transferred and incubated, achieving industrialization in Guangxi. He is also a leader of several scientific projects in China as well as international cooperation projects.



Prof. Dr. Zhongquan Nie is an associate research fellow of the College of Advanced Interdisciplinary Studies at the National University of Defense Technology, Changsha, China. He obtained his PhD in physics in 2015 from Harbin Institute of Technology, Harbin, China. His research fields include multidimensional light field control and its interaction with matter. He has published 80 papers in journals, such as Light: Science and Applications, Science Advances, Opto-Electronic Advances, Laser& Photonics Review, and Light: Advanced Manufacturing, etc.



Prof. Dr. Yan Chen, Associate Professor at National University of Defense Technology. His research focuses on integrated optics, quantum optics and ion chip. He has published more than 30 papers as the first or corresponding author in journals including Nature Nanotechnology, Physical Review Letters, Nature Communications, and Light: Science & Applications. He presides over the Youth/General Program of the Natural Science Foundation of China, and the Youth A and Youth B Programs of the Hunan Provincial Natural Science Foundation. He has been invited to deliver over 10 presentations at domestic and international academic conferences such as Light Conference 2025. He serves as a young editorial board member for Chinese Laser Press, Chip journal, and a reviewer for multiple journals.



Prof. Dr. Shao-Ding Liu is a Professor and Ph.D. Supervisor at Taiyuan University of Technology, China, where he is affiliated with the Key Laboratory of Advanced Sensors and Intelligent Control, Ministry of Education, and the College of Physics and Optoelectronics. His research focuses on micro/nanophotonics, nonlinear optics, and surface plasmon photonics, with particular interests in nanostructured optical materials and functional photonic devices. Prof. Liu has led multiple research projects funded by the National Natural Science Foundation of China, including the Young Scientists Fund, as well as provincial and national key research programs. He has received several prestigious honors, including Outstanding Young Academic Leader of Shanxi Higher Education Institutions, and Shanxi Young Top Talent. He was also selected as an outstanding innovative talent under the Shanxi “131” Program and the “San Jin Talents” Program. He received the Second Prize of the Shanxi Provincial Natural Science Award.



Prof. Dr. Yongping Zhai received his Ph.D. degree in Information and Communication Engineering from the National University of Defense Technology (NUDT), China. He is currently a professor and graduate supervisor at the College of Advanced Interdisciplinary Studies, NUDT, where he has long been engaged in super-resolution microscopy, micro/nano inspection, computational microscopy, and artificial intelligence. He has mastered core technologies including sub-100-nanometer super-resolution imaging, ten-gigapixel-class large-field high-speed scanning imaging, rapid microscopic focusing under extremely shallow depth of field, and high-precision 3D reconstruction imaging, and has developed ultra-high-speed large-field 3D scanning microscopy instruments that are now applied in chip imaging, biological detection, and nanomaterial characterization. He has published more than 30 papers in journals including Light: Advanced Manufacturing and Photonics Research, filed over ten invention patent applications, and authored one monograph. He received the Innovation Award of the 2026 Invention and Entrepreneurship Award of the China Association of Inventions.



Prof. Dr. Yan Zhou, Research Professor at the School of Physical Science and Technology, Nanjing Normal University, and Deputy Director of the Center for Semiconductor Phonons and Chip Thermal Management. He received his Ph.D. from the University of Bristol, UK. His main research interests include chip thermal management, micro-nano thermal measurement techniques, fabrication of high thermal conductivity materials, heterogeneous chip integration, and computational semiconductor physics. He has published more than 60 SCI papers, among which over 30 are first-author or corresponding-author papers, including 3 ESI Highly Cited and Hot Papers, and 2 cover papers. He holds more than 10 domestic and international patents and has won 5 Best Paper Awards at academic conferences. He has presided over nearly 10 national- and provincial-level projects, including talent programs and the General Program of the National Natural Science Foundation of China.



Prof. Dr. Kaiyun Zhan, he graduated from Harbin Institute of Technology, majoring in Optics. He is now associate professor and chairman of the Department of Optoelectronic Science and Engineering, School of Science, China University of Petroleum (East China). His interests include spatial solitons; optical imaging; light field control; optical waveguides and nonlinear optics.



Dr. Xiawa Wang is an Assistant Professor of Materials Science at Duke Kunshan University. She received her B.S., M.S., and Ph.D. degrees in Electrical Engineering from the Massachusetts Institute of Technology, where her doctoral research focused on radioisotope thermophotovoltaic energy conversion. She subsequently conducted postdoctoral research at Tsinghua University on semiconductor microfabrication and energy devices. Her research interests span thermophotovoltaics, thermal photonics, photovoltaic energy harvesting, functional materials, and machine-learning-guided energy conversion. A major theme of her work is the development of adaptive energy-conversion systems that integrate photonic spectral control, thermal management, semiconductor devices, and data-driven optimization. Her group also investigates spectroscopic and computational approaches for understanding the optical, electronic, and magnetic properties of functional materials. Through the combination of physical modeling, materials engineering, device development, and machine learning, her research aims to establish new approaches for harvesting and converting optical and thermal energy across diverse operating environments.



Dr. M. I. H. Sakib is a PhD student at the College of Physics and Optoelectronics Engineering, Harbin Engineering University, China. His research spans general relativity, compact object astrophysics, theoretical physics, optics, and nanophotonics, with a particular focus on horizonless compact objects and their observable signatures. His work includes exact relativistic interior solutions, compactness and gravitational redshift, anisotropic compact star models, tidal Love numbers, rotational properties, and stability analysis. He has published studies on gravastar-inspired compact object models and their observational consistency with neutron star constraints. His current research connects strong-gravity theory with photonic instrumentation through source-informed astrophotonics, translating compact object predictions into spectroscopic wavelength shifts and instrument requirements. His ongoing research aims to combine relativistic astrophysics with advanced optical spectroscopy, astrophotonic instrumentation, and integrated photonics to develop experimentally testable approaches for investigating compact objects, strong-gravity signatures, and future observational astronomy applications. He is also working on non-Hermitian nanophotonics and exceptional-point lasing threshold physics using analytical, numerical, and computational approaches.



Dr. Anna Lychagina is currently a PhD student at the Qingdao Innovation and Development Base, Harbin Engineering University and ITMO University. Her research focuses on exciton-polariton condensation, nonlinear photonics, and metasurface-based optical devices for ultrafast information processing. She is working on the design and fabrication of active metasurfaces with tailored resonant mode field distributions, aiming to develop stable coherent emitters with pre-defined nonlinear properties at room temperature. Previously she investigated laser and thermal oxidation of thin niobium nanofilms to form Josephson junctions. By controlling the parameters of the oxide layer using pulsed laser irradiation: the thickness, composition and homogeneity of the coating directly determine the characteristics of the contacts. This class of material is one of the key elements of superconducting electronics.



Dr. Ming Zhu, His research focuses on plasmonic nanolasers, photonic-crystal lasers, and momentum-space microscopy with angle-resolved measurement systems. His work includes mode identification and loss engineering in plasmonic band-edge lasers, as well as the topological properties of photonic-crystal bound-state-in-the-continuum (BIC) lasers. During my graduate studies, I received three provincial-level competition awards and filed one invention patent. His supervisor, Dr. Wenxin Wang, is a professor at the College of Physics and Optoelectronic Engineering, Harbin Engineering University, and the head of the Photonic Materials Group at the university's Innovation and Development Base in Qingdao. He received his doctorate in natural sciences from Technische Universität Ilmenau, Germany, in 2018. His research focuses on plasmonic lattice resonances, photonic-crystal band engineering, and structural coloration. He has published more than 30 academic papers.He has also received several competitive research grants and academic awards, delivered invited presentations at international conferences, and contributed actively to student mentoring, professional societies, and international academic exchange.



Dr. Yan Zheng is a PhD candidate in Materials Science and Engineering at Harbin Engineering University, supervised by Prof. Hao Wei. She is also an environmental protection engineer. She received her MSc in Environmental Engineering from Shanghai University and BEng in Chemical Engineering and Technology from Harbin Engineering University. She has research experience as a research assistant at Technische Universität Ilmenau, Germany. Her research focuses on micro-nano structure design and nanoimprint lithography. She has published multiple papers including articles in Opto-Electronic Science, Matter & Light, Small, Photonics Research, ACS Nano and ACS Applied Nano Materials, and has filed several national invention patent applications.

Introduction of the Conference Chair



Prof. Dr. Wenxin Wang earned his academic degree of *Dr. rer. nat.* (cum laude) at the Technische Universität Ilmenau (Germany) in 2018 and became the group leader of Photonic Materials Group (PMG) in the College of Physics and Optoelectronic Engineering as well as the Innovation and Development Base (Qingdao) at the Harbin Engineering University (HEU) in the same year. His main research interests include fabrication of planar and microtubular photonic crystals using artificial alumina membranes, developing plasmonic lattice resonances, and studying band structure of photonic crystals as well as structural color modulated by nanoscale lattice arrangement. So far, he has authored for more than 60 papers, many of which are published in high-impact scientific journals, and received some research prizes and prestigious fundings (13.45 million RMB in total), such as the third prize of the "Rising Stars of Light" in the Light conference of LSA in 2018. Meanwhile, he has given quite a few invited talks, such as Postdeadline talk at DPG conference, and organized scientific conference (e.g., the CPFN in 2014) as well as several social events in Germany. Furthermore, he has been invited by the Chinese Embassy in Germany as a scholar representative to welcome President Xi and Premier Li in their visit to Germany in 2014. Currently, he serves as the deputy president of Heilongjiang Western Returned Scholars Association (Oversea-educated Scholars Association of Heilongjiang), and the advisor of OSA-HEU student chapter as well as SPIE-HEU student chapter.

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Introduction of the Conference Co-Chair



Prof. Dr. Yong Lei is Professor and the Head of Department of Applied Nano-Physics at theTechnical University of Ilmenau, Germany. He started to work in German at Karlsruhe Institute of Technology in 2003 as an Alexander von Humboldt Fellow. From 2006 he worked at University of Muenster as a group leader and Junior Professor. In 2011, he joined Technical University of Ilmenau as a full Professor. His research focuses include template nanostructuring for energy conversion and storage. He has received a few prestigious EU and German research funding including two ERC (European Research Council) Grants. Prof. Lei is an Advisory Board Member or Associated Editor of Advanced Energy Materials, Small, Energy & Environmental Materials, Carbon Energy, InfoMat, and Science China Materials. He has authored 373 peer-reviewed publications (28720 citations, H-index 91), many published in high-level journals in physics and materials science, including 8 paper published in Nature-series journals, 77 papers in journals with IF > 18, 129 papers in journals with IF of 8-18.



Prof. Dr. Guosheng Shao is the Director of the State Centre for International Cooperation on Designer Low-carbon and Environmental Materials (CDLCEM), and Editor-in-chief for Energy & Environmental Materials (Wiley). He is also Founding Director of the Zhengzhou Materials Genome Institute (ZMGI, 2016), and Visiting Professor to the University of Surrey, UK (2018 -). He earned his PhD in materials science at the University of Surrey in 1995 and thereupon worked as a research fellow and senior research fellow, until transferring to the Brunel University as Reader in Materials in 2005. He joined the University of Bolton as Professor of Materials Modelling and Simulation in 2007, where he established the Institute for Renewable Energy and Environmental Technologies (IREET, 2011) as its founding Director, together with the responsibility as Head of Engineering, Science and Sports etc. His academic interest is “designer” materials and application devices, using a materials genome approach to facilitate cost-effective development of novel materials. He has published over 400 papers in core SCI journals and has been a lead inventor for over 40 granted Chinese/international patents with technologies based on green mass-production of almost defect-free graphene being actively exploited commercially. His current focus is mainly on sustainable energy systems and environmental/eco--health technologies.

Introduction of the Conference Secretary



A.P. Dr. Yi Wang, forum secretary of AEFM 2026, from Photonic Materials Group (PMG), College of Physics and Optoelectronic Engineering, Qingdao Innovation and Development Center of Harbin Engineering University. She served as a joint PhD. at the Physics Department of Ilmenau University of Technology in Germany, received her doctoral degree from State Key Laboratory of Supramolecular Structures and Materials, Jilin University in 2018, and joined the Photonic Materials Group as a young talent in the same year. She is a researcher specializing in nanophotonic engineering, with contributions to two-dimensional (2D) photonic crystals, subwavelength plasmonic lattices, and their optical signal regulation. Her work encompasses the precision design of tunable 2D optical architectures, development of structural colors, and realization of surface lattice resonance-enhanced nanolasers with second harmonic generation (SHG). As principal investigator, she has secured 10+ competitive grants from the National Natural Science Foundation of China (NSFC) and key provincial programs, while publishing 30+ peer-reviewed papers on cutting-edge topics including hybrid plasmonic-dielectric systems, and plasmonic nanolasers. Recognized as a provincial-level talent expert, Dr. Wang maintains active membership in the German Physical Society (DPG), Optica, and SPIE, while mentoring future scientists as faculty advisor for Optica and SPIE student chapters. Her research bridges fundamental photonic principles with applications in optical encryption, on-chip lasers, and light-matter interactions.

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Abstracts of Plenary Talks

Acceptance or Rejection: Insider Tips for Rapid and Successful Publication in Top Journals-Insights from the Advanced and Small Journals

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ABSTRACT

In this talk I will provide some insider tips on how to improve your chances of publishing your research in some of the top journals from the Advanced portfolio and the Small family. What key decisions do you face as an author? What does an Editor look for in a submission? As AI begins to play a more dominant role in the process, what guidelines should I follow?

Biography: I was born in Leeds in the UK and did a PhD in chemistry at the University of Newcastle upon Tyne followed by postdoctoral research at the University of Heidelberg in Germany. I joined the editorial offices of Angewandte Chemie in 1992, and have over 30 years experience in a variety of editorial roles. I have served as Editor-in-Chief at Angewandte Chemie, Chemistry – A European Journal, ChemPlusChem and most recently at Small. Over the years I have won 3 Wiley pacesetter awards associated with publishing developments and improvements for authors.

Optomechanical Springs for Extreme Microforce Metrology

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ABSTRACT

The precise measurement of microscale and nanoscale mechanical forces is critical for advancing modern optomechanics and functional materials. To overcome the limitations of conventional metrology, we developed a highly versatile force sensing platform grounded in customizable three dimensional micro spring structures. This presentation outlines our systematic progression in microforce metrology, logically divided into steady state and transient measurement regimes. We begin by briefly discussing the fundamental mechanical modeling and optimized two photon polymerization fabrication of these micro springs, ensuring robust structural integrity and tunable stiffness. Building upon this structural foundation, we detail our breakthroughs in steady state measurements. By integrating these optimized springs onto optical fibers to form highly sensitive optomechanical cavities, we achieved an unprecedented steady state force resolution down to tens of piconewtons, enabling the precise characterization of minute static interactions such as airflow turbulences. Transitioning to the transient regime, we introduce the SWIFT platform, which leverages this spring cavity architecture to achieve microsecond resolution in transient optical force metrology. This wideband capability allows us to capture ultrafast mechanical dynamics in real time. Finally, we highlight our most recent advancement known as the FINEST probe, which pushes the boundaries of this transient metrology into the extreme domain of electron beam momentum transfer. By directly translating complex electron scattering interactions into empirical mechanical readouts, the FINEST probe provides groundbreaking insights into interactions between electrons and matter at the nanoscale. Ultimately, this series of works establishes a comprehensive methodological standard ranging from steady state to transient dynamics, opening exciting new avenues for exploring complex physical phenomena in advanced functional materials and integrated microscale technologies.

III-V semiconductor nanowire arrays for next generation optoelectronics

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ABSTRACT

III-V compound semiconductor nanowires have drawn much attention as nanoscale building blocks for optoelectronic/photonic integration owing to their nanoscale size, excellent optical and electrical properties, and strain relaxation ability for lattice-mismatched systems enabling epitaxial growth of a wide range of high-quality materials and structures. In particular, highly uniform, ordered, vertical nanowire arrays exhibit strong geometry related light matter interaction properties, offering unique flexibility for the design of a variety of geometry-tunable high performance and multifunctional light emission and detection devices, as well as light activated gas sensors. In this work, I will present our recent work on design, growth and fabrication of III-V nanowire array-based lasers, LEDs, photodetectors and gas sensors for next-generation integrated photonic/optoelectronic systems and IoTs.

Well-defined nanostructuring for electrochemical energy conversion and storage

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ABSTRACT

Innovative technology for electrochemical energy conversion and storage is the key for so-called “clean energy” to realize a worldwide sustainable energy future. To compete with existing energy supply systems mainly based on fossil fuels, the efficiency of clean energy conversion and storage shall be largely improved. The intricate electrochemical reactions of energy conversion and storage and the involved kinetics and transport behaviors are closely associated with the selected materials and structures of electrodes. To this point, we proposed a concept of well-defined structuring of electrodes for improving the electrochemical performance of energy conversion and storage, which have gained high research attention in the past years. We are using especially a template-based technique with scalable, cost-effective and fast fabrication processes for electrode design. The well-defined electrode structures possess large-scale arrayed configuration with highly controllable geometrical parameters (i.e., size, shape, heteroarchitecture, spatial arrangement, composition, surface vacancies), high density and perfect regularity. Such well-defined electrode structures are highly desirable for constructing devices for efficient energy conversion and storage, including photocatalysis and electrocatalysis devices; sodium-ion, potassium-ion and zinc-ion batteries, and supercapacitors. The achieved high performances demonstrated that the well-defined structuring and material design play a crucial role for optimizing the energy conversion and storage devices via precise controlling structural features, indicating the high potential and importance of template-based well-defined nanostructuring and material design for both basic research and industrial device applications.

Nano Green Printing and Manufacturing Technology

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ABSTRACT

Based on the fundamental scientific issues of nanomaterial preparation and functional inkjet patterning, a systematic Nano Green Printing technology has been developed by studying the construction of nanomaterials with differential wettability on material surfaces. The precise control of the conversion from translational kinetic energy to rotational kinetic energy before and after droplet collision has been achieved using patterned wettability surfaces. This process breaks through the scope of classical Newton's collision law and realizes a change in the motion mode of droplets before and after collision, providing new ideas for the preparation and precise control of high-precision patterns. Starting from the manipulation of droplets for three-dimensional shaping, spontaneous contraction of droplets in three-dimensional space has been achieved by using templates, enabling rapid assembly and shaping of three-dimensional micro/nano structures using single or multiple materials. Furthermore, the evolution of foam has been controlled using micro-templates, overcoming the long-standing challenge of patterned control of bubbles, and realizing the anti-Oswald ripening and patterned printing of bubbles. This has been used as a printing template for the assembly of multiple functional materials. In particular, by utilizing the advantages of droplet manipulation in nanoscale green printing and discovering the critical conditions for the scattering-diffraction transition of nano-photonic structures, an optical metamaterial detection chip has been developed for ultra-sensitive and rapid detection of novel coronavirus, influenza virus, and tumor markers. This opens up new ideas for the printing preparation of functional devices and micro/nano chips, and establishes the theoretical and technical system of nanoscale green printing technology.

Near-field microscopy: from Microwave to Terahertz Frequencies

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ABSTRACT

Collective or random motions of single quantum quantities including charges, spins and momentums, normally names as quasi-particles in quantum materials, are crucial to many potential applications such as quantum information, catalysis, energy storage, etc. Such motions are normally localized at the micro-to-nanometer scale, with their ultrafast responses ranging from femtosecond to picosecond, and with their resonance energies lying in the microwave or terahertz frequencies. It has been a long endeavor effort to develop nearfield microscopic techniques covering the range from microwave to terahertz, especially within the coverage of multi-fields of temperature, magnetic, or light. However, the transition from the great successes in the nearfield microwave microscopy to the terahertz has been extremely challenging.

In this talk, the past effort on developing near-field microwave techniques is introduced, as well as those challenges facing the shifting to the terahertz waveband. Solutions to terahertz components, terahertz sources, and terahertz measuring systems are then introduced. Finally, a construction of new terahertz near-field microscopy system under multiple physical fields and recent research achievements coming with this system are introduced.

From Trial and Error to Rational Design — Advances in Optical Measurement Technologies for Microfabrication

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ABSTRACT

As advanced chip manufacturing processes move to the 3-5 nm node, micro-scale structures break through the traditional optical diffraction limit. Multi-layer stacking and 3D advanced packaging of chips bring highly complex structural systems. Conventional optical measurement methods relying on empirical trial-and-error suffer from heavy computation load, low efficiency and insufficient stability, which restrict the improvement of detection accuracy for high-end semiconductors. The team from Shanghai Ideaoptics Corporation has carried out joint research with Fudan University. A physics-enhanced neural network is constructed, combined with spectral topological-space analysis to select optimal measurement conditions. This transforms semiconductor optical measurement from empirical trial-and-error to theory-driven rational design. The technology has been industrially implemented, with self-developed instruments deployed in domestic semiconductor production lines. The enterprise has achieved rapid output-value growth, and its core technologies can also be extended to cutting-edge fields such as biological detection.

Graphene: structural basis, sustainable manufacturing of almost defect-free graphene powders, and applications

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ABSTRACT

The structure of graphene is essentially a single layer lattice plane, (0001), from graphite crystals. It belongs to a phase structure of elemental carbon, where C-C bonds are formed by three localized sp^2-type σ bonds of equal strength, creating a hexagonal network structure. The non-localized π bonds are the intrinsic source of the excellent electrical conductivity and thermal conductivity. Strictly speaking, the definition of "graphene" deviates from the classical chemical concept of "-ene" for alkene, since it is not an organic compound and does not possess the chemical reactivity of organic alkenes.

The nearly defect-free graphene powder preparation technology invented by our team fundamentally avoids the issue of introducing numerous oxidative lattice ablation defects in graphene-like structures of the chemically reduced graphene oxides (RGO). This ensures the perfect crystal structure of the graphene products thus preserving their many exceptional intrinsic properties, including a combination of excellent strength and toughness, ultra-high electrical conductivity and thermal conductivity, superior thermal radiation capabilities across a wide wavelength range due to the typical Dirac electronic structure of graphene, high chemical inertness, and excellent anti-corrosion and superb lubrication properties.

Based on these advantages, such graphene powder has been applied in fields such as healthcare, energy-efficient heating, energy storage batteries, and functional coatings, demonstrating outstanding performance.

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Key Materials and Energy Storage Mechanisms for Zinc-Based Batteries

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ABSTRACT

Zinc-based batteries, particularly zinc-air batteries and aqueous zinc-ion batteries, are promising next-generation high-energy-density power sources due to their high theoretical energy density, intrinsic safety, and low cost. However, practical commercialization faces challenges including high charging voltage, low discharge voltage, poor energy efficiency, and limited cycle life at high current densities. The root causes are sluggish reaction kinetics, dendrite growth, and structural collapse of the electrode materials. To address these bottlenecks, our research focuses on advanced key materials and novel energy storage mechanisms under the strategy of "New Materials—New Architecture—New Mechanisms." For key materials, we develop several key materials for zinc-based batteries, such as heteroatom-doped carbon-based catalysts, transition metal-based cathodes, and engineered zinc anodes for dendrite suppression. These materials effectively enhance reaction activity and stability. Furthermore, we introduce external field coupling (light, electric, magnetic) and high-entropy engineering to optimize electronic structure and reaction pathways. For energy storage mechanisms, we utilize in-situ characterization techniques to reveal reaction kinetics and in-depth mechanisms of electrode materials. This work provides new insights into the correlation between catalytic activity and stability, paving the way for the practical application of high-performance zinc-based batteries.

Development and Status of Integrated Microcavity Optical Gyroscopes

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ABSTRACT

With the rapid development of various micro unmanned systems, the demand for miniature autonomous navigation systems has become increasingly urgent. As the next-generation angular rate sensor, the integrated optical gyroscope features high precision, miniaturization, low cost and the potential for mass production. It carries important strategic significance for the autonomous navigation of various micro unmanned systems in land, sea, air and space applications in the future. At present, remarkable progress has been made in integrated optical gyroscope technologies based on silicon and other platforms. However, there remains a substantial gap before full optical chip integration can be realized. This report introduces the development trends, challenges and key scientific issues of integrated optical gyroscopes at home and abroad, and puts forward several suggestions for China's development in relevant fields.

Recent Advances in Ghost Imaging Research at Shanghai Institute of Optics and Fine Mechanics

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ABSTRACT

Prevailing active and passive optical imaging systems are predicated on a direct “one-to-one” correspondence between the object and image planes. This approach fails to exploit the inherent compressibility of image information, resulting in suboptimal acquisition efficiency—significantly below the Shannon channel capacity of the imaging system. Crucially, although the imaging electromagnetic field harbors complex high-dimensional degrees of freedom—spanning amplitude, phase, polarization, spectral composition, and spatial coordinates—the lower dimensionality of standard detectors renders it impossible to concurrently resolve these multiplexed parameters via single-exposure imaging.

With the breakthrough advances in modern light-field modulation technologies and novel optical imaging techniques based on higher-order correlations of light fields, it has now become possible to encode the target scenes to be imaged with controllable spatiotemporal fluctuations of light field during the imaging, and high-dimensional image information carried by the light field can be encoded, modulated, and compressed into lower-dimensional space which enables direct acquisition of high-dimensional image information using low-dimensional ("point" or "plane") detectors. This opens up new opportunities for understanding and optimizing optical imaging systems from an information-theoretic perspective. The talk will present recent progresses in adaptive information-maximization encoding for ghost imaging, coherent detection ghost imaging lidar, high-dimensional ghost imaging camera, and table-top X-ray Fourier-transform ghost imaging at Shanghai Institute of Optics and Fine Mechanics (SIOM). The future research plans in the field of ghost imaging technology and its applications at SIOM will also be reported.

Powering the future via solid state chemistry

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ABSTRACT

Energy materials are the enabler for many of the key technologies that offer hope to address climate change and air pollution. Here we explore the role of stoichiometry, defects and interface control in optimising functional performance and durability in a range of important processes. We will address ion migration, electrochemical conversion, catalysis and energy storage.

Hybrid perovskite materials and the application in lasers

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ABSTRACT

Recently, organic/inorganic hybrid perovskite materials have attracted tremendous attention owing to their promising applications in photovoltaics, LEDs and lasers. Their unique characteristics, including long charge-carrier diffusion length, extremely low non-radiative recombination rate and high luminescence efficiency, enable excellent device performance. In this talk, I will discuss the origin of these superior material properties and their applications in photonic lasers, plasmonic lasers, external-cavity-free nanolasers, and submicron optical frequency combs. The corresponding devices feature low thresholds and high Q factors.

Abstracts of Keynote Talks

Forum 1: Nano-Functional Materials

Controlling Energy Transfer in Lanthanide Nanocrystals via Atomic Engineering

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ABSTRACT

With ladder-like energy levels inherent from 4f electron shells, rare-earth ions serve as ideal photon converters. Engineering lanthanide nanoparticles with Stokes and anti-Stokes emission in the visible and near-infrared (NIR) regions is highly desirable. These nanoparticles offer exceptional photostability and higher multiphoton emission efficiency compared to standard multiphoton fluorophores. Upconversion emission, which involves two- or multiphoton processes via long-lived intermediate states, has been extensively explored. Beyond classical upconversion from lanthanides, cross-relaxation-mediated positive interionic energy loops present an attractive mechanism for high-resolution imaging. We developed a parallel multiphoton process with monotypic emitters, holmium ions. Under 965 nm excitation, which resonate with excited state absorption, and a prominent cross relaxation are rationally engineered to generate red and green emissions. A spatial resolution below 100 nm at the single-particle level, as well as multicolor high-resolution imaging at the subcellular level, is demonstrated for imaging. Furthermore, efficient NIR emission from lanthanide nanoparticles is explored, extending the spectral range from 800 nm to 1800 nm. Collectively, these lanthanide nanoparticles hold great promise for advanced photonic technologies, harnessing their largely untapped luminescent behaviors.

References:

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Brightening upconversion nanoparticles

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ABSTRACT

Lanthanide-doped upconversion nanoparticles (UCNPs), which convert low-energy near-infrared excitation into higher-energy emission, have attracted considerable interest for applications in photonics, bioimaging, sensing, and energy conversion. However, their practical performance is often limited by intrinsically weak lanthanide absorption, surface-related nonradiative losses, inefficient energy migration, and concentration quenching. This presentation discusses recent advances in understanding and modulating the brightness of UCNPs through rational nanostructure design and photophysical engineering.

Precise synthetic control provides the structural basis for regulating upconversion processes. Strategies including controlled thermal decomposition, seed-mediated layer-by-layer growth, and feed-ratio optimization enable accurate tuning of nanoparticle size, active-layer thickness, and core–shell interfaces. Several complementary approaches to brightness enhancement are then highlighted. Dye sensitization substantially increases the effective absorption cross-section of lanthanide-based systems and enables efficient near-infrared excitation. Size-dependent studies reveal the interplay between surface quenching and long-range lanthanide energy transfer, providing quantitative insight into the reduced efficiency of nanoscale upconversion systems and identifying a characteristic energy-transfer distance. In parallel, coupling UCNPs with an engineered optical environment can strongly enhance single-particle emission through plasmonic and Purcell effects. Finally, nanoscale spatial confinement and active-layer engineering suppress energy back-transfer and cross-relaxation, thereby mitigating lanthanide concentration quenching and allowing higher activator concentrations.

Super artificial enzyme with well-defined catalytic centers resembling natural enzymes

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ABSTRACT

Proteins can be regarded as a distinct category of nanoparticles (NPs), exhibiting numerous advantages over existing engineered NPs. They are the most delicate and complicated molecules that are essential for life. One of their most distinguishing characteristics is their sophisticated atomic structures, with thousands of different atoms organized in three dimensions to work together dynamically. By contrast, the atomic structures of all current engineered NPs, whether in a precise crystalline structure or an amorphous state, are very simple, as are their functions. However, natural proteins also have some disadvantages compared to engineered NPs, primarily their instability. This disadvantage is rooted in the fundamental restrictions of heredity and metabolism that are essential to life. Without these restrictions, it would be possible to combine the advantages of natural proteins and engineered NPs to create artificial proteins that surpass natural ones. To this end, we have developed special conformational engineering technology to create a class of artificial proteins, including artificial enzymes, that combine the sophisticated functions of natural proteins with the stability of engineered nanoparticles (NPs). Artificial enzymes created using this technology have well-defined catalytic centers that resemble those of natural enzymes, demonstrating highly efficient activity comparable to natural enzymes and excellent stability that far surpasses that of natural enzymes.

Single-Cell Geometric 3D Genome Reconstruction by Sequential-GAM and High-Precision Fluorescent Signal Detection by DEPAF

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ABSTRACT

The three-dimensional structure of the genome is crucial for cell identity and gene regulation. While traditional methods have made significant progress in revealing the hierarchical organization of chromatin, challenges remain in constructing geometrically accurate 3D genome structures at the single-cell level and in detecting ultra-high-density fluorescence signals under strong interference for spatial transcriptomics and imaging. To address these challenges, we present two complementary innovations. First, we developed Sequential-GAM (Sequential Genome Architecture Mapping, Nucleic Acids Research, 2026), a method that constructs single-cell geometric 3D genome structures through continuous nuclear sectioning. By performing sequential 200 nm-thick cryosections of individual nuclei followed by sequencing, and constrained by the power-law relationship between spatial and genomic distance along with positional information from Lamina-Associated Domains, Sequential-GAM reveals the radial organization of chromosomes, compartments, TADs, and genes at single-cell resolution. We identified “quasi-stable TADs” and uncovered correlations between chromatin activity, structural stability, and gene expression.

Second, to overcome challenges in fluorescence imaging which can be used to verify the geometric 3D genomic structure at large scale, we developed DEPAF (Deep Pattern Fitting, Nature Computational Science, 2026, accepted), a self-supervised learning algorithm that uses Patterns of Interest as fundamental units to perform highly parallel signal fitting and global denoising. DEPAF significantly enhances signal detection across multiple imaging modalities including single-molecule localization microscopy, MERFISH, and two-photon calcium imaging, improving temporal resolution to milliseconds and enabling high-precision 3D reconstruction under strong background interference. Together, these complementary approaches expand the technical boundaries of single-cell 3D genomic research, promise to advance single-cell and spatial multi-omics studies in future, and promote further clinical applications.

Materials, Devices, and Systems for Smart Gas Sensors and Electronic Nose

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ABSTRACT

Gas sensors and electronic noses are playing increasingly vital roles in various fields, including environmental monitoring, safety protection, industrial production, and medical diagnostics etc. Gas sensing materials are the key foundation of the sensors. Various oxides, sulfides, peroskites materials are developed and used in detecting typical industrial, environmental and exhale gases such as H_2, CO, CH_4, NO_2. Thin film and MEMS sensing devices are fabricated using these materials and show high sensitivity, fast response and longterm stability. The devices are organized to form electronic noses and to monitor and distinguish gases in complex environmental. The supporting circuits and algorithms are chosen and optimized. A smart electronic nose is then completed and integrated onto the hand back of a robot, which is expected to work in future coffee shop, nursing home and baby care etc to recognize different gases and to help the robot responding accordingly.

Optically Addressing Spin Relaxation Mechanism in 2D Hybrid Organic-Inorganic Perovskites

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ABSTRACT

The key to spintronics is to control the spin relaxation mechanism and obtain spin states with a high polarization degree and long spin lifetime. Two-dimensional (2D) hybrid organic-inorganic perovskites (HOIP) have attracted great attention for spintronic applications. Here, we investigate the spin relaxation mechanism in 2D HOIP by using temperature-dependent circularly polarized transient absorption (TA) spectroscopy with pump photon energy in excess of the resonance energy of band-edge excitons. At low temperature, a spin lifetime as long as 200 picoseconds and even up to nanoseconds was achieved in PEA2PbI4 and EOA2PbI4 films, respectively. We attribute this control to the formation of charge transfer (CT) states due to the coexistence of different domains in 2D HOIP. Specifically, hot electrons can cross a potential energy barrier and transfer from the high-energy domain to the low-energy domain, thereby reducing the electron-hole wave function overlap that modulates the spin relaxation mechanism from the Maialle-Silva-Sham mechanism to the Elliott-Yafet mechanism. More intriguingly, owing to the spin selection rules, the spin polarization degree can be reversed by tuning the photon energy of the pump laser. Such optical-modulated spin states with high spin polarization degree and long spin lifetime provide a novel opportunity for spintronic devices.

Structure modifications of layered oxides cathode materials for sodium-ion batteries

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ABSTRACT

Mn-based layered oxide cathodes with oxygen anionic redox reaction (OAR) for sodium-ion batteries (SIBs) hold great potential for energy storage applications due to their ultra-high capacity and cost effectiveness, which can achieve additional specific capacities exceeding 250 mAh g−1 and ultra-high energy densities of over 900 Wh kg−1. However, achieving high capacity requires overcoming challenges such as oxygen-redox failure, sluggish kinetics, and structural degradation, which gravely hinders its practical applications. Herein, we first explored the OAR mechanisms in SIB cathodes, and then investigated the structural evolution behaviors and revealed the capacity fading origins for these high-capacity cathodes. Based on the above findings, several structural modification strategies including composition optimization, crystal modulation, and their combinations have been proposed. At last, we highlight that the understanding of the local superstructure formed in the SIB cathodes would accelerate minimizing the gap between SIBs and conventional lithium-ion batteries.

Forum 2: Advanced Energy and Environmental Materials

Reverse-Bias Degradation in Perovskite Solar Cells and Modules: From Outdoor Power-Station Evidence to Interfacial Solutions

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ABSTRACT

Perovskite photovoltaics lack long-term field data for large-area modules, and how such modules fail is still incompletely understood. Here we report nine months of outdoor operation of three industrial 2 m^2 perovskite modules (6 m^2 total) integrated into a photovoltaic-storage-load system under a subtropical maritime climate. Using a temperature-corrected performance ratio (PRT), we separate reversible thermal effects from intrinsic evolution and estimate an annualized performance evolution rate of about 4.7% per year, exceeding the 0.5-0.8% per year benchmark of crystalline silicon and identifying encapsulation and ion-migration control as priorities. Irradiance governs more than 90% of the winter-spring output variance, whereas summer heat reversibly suppresses instantaneous power without cumulative loss. Against PERC silicon, the modules run up to about 10 °C cooler and sustain 1.2-2.4 h of effective generation per day versus 0.8-1.2 h, with the widest margin at dawn, dusk and under cloud. Electroluminescence imaging, morphology and thermal mapping reveal heterogeneous degradation nucleated at module edges, junction-box hotspots and laser-scribed interconnections: the EL intensity coefficient of variation rises from 0.374 to 0.402 and bright-anomaly density increases about 3.7-fold, clustering along the series-interconnection direction. The junction box concentrates current mismatch, Joule heating 6-8 °C above the module centre, and localized reverse bias, and perovskite devices degrade irreversibly below 5 V. Because avalanche breakdown is absent in these devices, reverse-bias tolerance is a precondition for long-term reliability. A self-assembled monolayer at the NiOx/perovskite interface suppresses Ni^{3+} reduction and raises the breakdown voltage, delivering 24.2% efficiency and stable operation after 6 h at -1 V. These results link field degradation, spatial failure mapping and interfacial materials design into a single framework for reliable large-area perovskite photovoltaics.

Advanced thermophotonics for plasmonic printing and radiative cooling

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ABSTRACT

Thermophotonics empowers the transformation of conventional laser manufacturing and sustainable thermal management in green buildings and data centers. Deeply rooted in our profound understanding of plasmonic local heating (Nature Communications 2022, 13, 6144), we have recently developed an innovative manufacturing technology, termed plasmonic photothermal printing, for low-cost, high-throughput fabrication of high-density metal oxide electronics (Nature Materials 2025, 24, 2001). It enables fabricating high-density, solution-processed all-metal-oxide transistor arrays, with a density up to 48,400 per square centimeter, and integrated logic gates, delivering performance on par with vacuum-based high-temperature-annealed counterparts. Based on meta-resonance-enhanced radiative heat dissipation (Advanced Materials 2020, 32, 1906751), we have developed a lossless colored radiative cooling device. Its cost-effective preparation, environmental durability, aesthetic stability and recyclability enable promising applications in both large-scale green buildings (Nature Energy 2026, 11, 985) and small-scale green electronics (Science Advances 2023, 9, eadg1837). These studies form a closed-loop framework of "light-to-heat-enabled precision manufacturing – heat-to-light-mediated efficient thermal dissipation" that breaks through long-standing bottlenecks of high-temperature vacuum treatment and high-energy consumption in traditional electronic manufacturing and active cooling.

Zero-Carbon Traction Power Supply Technology for High-Speed Maglev

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ABSTRACT

High-speed maglev transportation, with operating speeds of up to 600 km/h, is powered by ground-based traction substations feeding long-stator linear synchronous motors through segmented supply sections of 30–50 km. The traction power supply system accounts for the majority of total energy consumption, yet the existing architecture, based on fixed stator-segment lengths and fixed substation spacing, is not energy-optimal under wide-speed-range and variable operating conditions. Moreover, the regenerative braking energy, reaching 10–30% of traction energy, is mostly dissipated in braking resistors, while the elevated bridge-supported tracks offer considerable trackside photovoltaic (PV) potential that remains underexploited. This presentation reports recent progress on green power supply technologies for high-speed maglev systems. First, a dynamic dual-end power supply model incorporating train position, speed, temperature, and supply frequency is established, revealing the quantitative relationship between supply topology parameters and system losses. A variable step-length traction supply scheme and a real-time current-allocation strategy that minimizes feeder-cable losses are then proposed; simulations show that line losses can be reduced by up to 33%, and a multi-objective control method suppresses circulating currents while guaranteeing traction performance. Second, a zero-carbon maglev architecture is constructed that integrates trackside PV generation, supercapacitors, and lithium-ion batteries through bidirectional Dual Active Bridge DC/DC converters on the 5 kV DC link, with hierarchical control combining maximum power point tracking, adaptive fuzzy charge–discharge thresholds, and a model-predictive-control-based energy management system for braking energy recovery and renewable energy utilization. Simulation and hardware-in-the-loop results validate the effectiveness of the proposed methods, providing theoretical support and key technical reserves for efficient, green, next-generation high-speed maglev systems.

Excited-State Dynamics in Organic Photovoltaics

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ABSTRACT

The rapid development of flexible electronics and wearable energy technologies has created an urgent demand for lightweight, bendable photovoltaic devices. Organic photovoltaics, owing to their intrinsic mechanical flexibility and solution processability, have emerged as a promising direction, yet their efficiency and stability remain constrained by excited-state processes. This talk focuses on the excited-state dynamics in non-fullerene organic photovoltaics. Using ultrafast transient absorption and time-resolved fluorescence spectroscopy, we systematically investigate key processes including exciton generation, diffusion, charge-transfer state formation, and dissociation, and reveal how molecular packing, phase-separation morphology, and flexible processing conditions influence excited-state behavior. Our studies show that suppressing non-radiative recombination and optimizing the energetic disorder at donor/acceptor interfaces are crucial approaches to reducing voltage loss and improving the efficiency and stability of flexible devices. These findings provide physical insights at the excited-state level for the design of high-performance organic photovoltaic materials and devices.

Glass scintillator: A window to future radiation detection and imaging

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ABSTRACT

Scintillators serve as the "eyes" of radiation detection and imaging systems. Among scintillator materials, scintillating glass presents a compelling alternative to conventional single crystals and ceramics. Its advantages lie in lower fabrication and processing costs, flexible shaping, and suitability for large-scale industrial production—making it a critical enabler for next-generation particle colliders and advanced radiation detectors. HEU has focused on developing scintillating glass with superior "high brightness and fast decay" characteristics. Through innovative material design, the team has pioneered novel gadolinium-enriched and lithium-enriched fluorosilicate glasses, as well as advanced nanocrystal composite glass-ceramics. The study has successfully overcome fundamental scientific challenges related to the formation mechanism, scalable production, and practical application of these novel glass systems with high concentrations of Gd^{3+} and Li^{6+}. The resulting scintillating glass achieves record performance metrics, meeting the stringent requirements of Circular Electron Positron Collider (CEPC) and the 2D planar neutron detectors. This presentation will detail the team's recent research breakthroughs in scintillating glasses and outline the strategic goals for future development.

Operando X-ray Spectroscopy for Sustainable Energy Storage and Conversion

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ABSTRACT

This report focuses on the carrier transport and migration rules and regulatory mechanisms between the multiphase interfaces. As shown in Figure 1, the electron transfer process at the two-phase and three-phase heterogeneous interfaces was observed through the self-designed optical field-coupled in-situ X-ray photoelectron spectroscopy. Further, quantitatively study the wave-dependent electron transfer was carried out experimentally. The Boltzmann function relation with wavelength and the asymptotic function relation with valence state for the change of binding energy are clarified by using the spatiotemporal resolution single nanoparticle microscopic imaging technique to determine the spatial distribution of transferred electrons. In addition, coupling light field and electric field were applied to the catalytic mechanism of lithium-sulfur batteries. The physical mechanism of lithium-sulfur selective catalysis was described from three perspectives: molecular level (adsorption and mass transfer of polysulfide), atomic level (establishment of catalytic center), and electronic level (directional migration of electrons and holes).

Electrocatalysis of Small Alcohol Molecules

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ABSTRACT

Small alcohol molecules (ethanol, ethylene glycol, etc.) have attracted widespread attention due to their light weight, high energy density, mild operating conditions, and simple system design. Platinum-group-metal (PGM)-based materials, owing to their excellent electronic structures, have become the most commonly used catalysts in direct liquid fuel cells. However, issues such as the high cost of PGMs, sluggish reaction kinetics, incomplete oxidation of small alcohol molecules, and catalyst poisoning have severely constrained the commercialization of direct liquid fuel cells. Developing efficient and highly selective catalysts is one of the keys to promoting their rapid commercialization. On this basis, this report focuses on factors including the local coordination environment of catalysts, support effects, alloy effects, and surface/interface engineering design, and explores their reaction pathways and underlying mechanisms.

Electrolyte Design and Interfacial Performance Regulation for Solid-State Sodium-Ion Batteries

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ABSTRACT

In recent years, sodium-based batteries have attracted considerable attention for applications in starting power supplies, low-speed electric vehicles, and large-scale energy storage, owing to their low cost, abundant sodium resources, and excellent low-temperature performance. As a promising complement to lithium-based batteries, sodium-based batteries could contribute to the broader deployment and utilization of renewable energy. However, sodium-based batteries still face critical challenges, including low energy density, limited cycle life, and poor rate capability. Therefore, the development of novel battery material systems and performance regulation strategies is urgently needed to overcome the existing electrochemical performance bottlenecks.

As a core component of batteries, the electrolyte directly governs key electrochemical properties, such as energy density, power density, and cycling stability. High-performance solid-state electrolytes not only enable higher energy density but also ensure stable battery operation under diverse operating conditions. Moreover, rational design of solid-state electrolytes to regulate electrode/electrolyte interfacial properties has emerged as a key research focus for improving the electrochemical performance of sodium-based batteries. Based on this strategy, a multilayered composite solid-state electrolyte with mixed ionic-electronic conductivity was rationally designed across multiple length scales to construct an internal electric field at the battery interface. This design enabled a more uniform distribution of the electric field and Na^+ concentration field at the anode/solid-state electrolyte interface, thereby enhancing interfacial Na^+ transport kinetics. As a result, uniform Na deposition on the anode surface was promoted, leading to improved rate capability of the battery. The solid-state Na||Na cell exhibits stable cycling for 26,400 cycles at a current density of 0.1 mA cm^{-2}. Meanwhile, the solid-state Na||$Na_3V_2(PO_4)_3$ cell delivers an outstanding capacity retention of 97.4% after 1,500 cycles at 2 C and maintains stable charge-discharge cycling even at −20 °C, demonstrating electrochemical performance that is competitive with that of state-of-the-art solid-state sodium batteries.

Lanthanide Contraction Regulates the Structure, Photocatalysis, and Terahertz Response of PMo_{12}-Based Rare-Earth Methylenediphosphonate Complexes

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ABSTRACT

Fourteen Keggin-type phosphomolybdate-based rare-earth complexes, $[Ln(L_1)_4](PMo_{12}O_{40})$ (Ln = La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, and Er; 1-11) and $[Ln(L_1)_3(H_2O)_3](PMo_{12}O_{40})$ (Ln = Tm, Yb, and Lu; 12-14), were synthesized by a mild water-bath reflux method using tetraisopropyl methylenediphosphonate (L_1) as the organic ligand. Single-crystal X-ray diffraction revealed a lanthanide-contraction-driven switch in coordination mode. In complexes 1-11, each Ln^{3+} ion is eight-coordinate with four bidentate L_1 ligands, whereas complexes 12-14 contain two bidentate L_1 ligands, one monodentate L_1 ligand, and three coordinated water molecules around Ln^{3+}. The $[PMo_{12}O_{40}]^{3-}$ anion remains noncoordinating and supports crystal assembly through electrostatic and weak interactions. Complex 1 crystallizes in the triclinic system, while complexes 2-14 are monoclinic; powder X-ray diffraction confirmed high phase purity. The materials show good thermal stability and direct optical band gaps of 2.437-3.006 eV, with strong ultraviolet absorption. Under 365 nm irradiation, all complexes efficiently degraded rhodamine B (89.98-96.01% after 90 min) and ciprofloxacin (89.65-97.51% after 120 min). Five-cycle tests on representative complexes retained activity and crystal structure. Scavenger experiments with complex 1 identified hydroxyl radicals, superoxide anion radicals, and photogenerated holes as the principal active species. Terahertz time-domain spectra recorded from 0.4 to 2.4 THz displayed closely related profiles, including a characteristic peak cluster at 1.0-1.2 THz; subtle intensity and line-shape variations distinguished individual lanthanides. These results connect lanthanide contraction with coordination, packing, photocatalytic behavior, and low-frequency dynamics, and support this family as stable photocatalysts for dye and antibiotic removal.

Beyond Band Alignment: Engineering Ultrafast Carrier Dynamics at Buried Photocatalytic Interfaces

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ABSTRACT

Favorable band alignment does not guarantee efficient photocatalysis: a buried heterointerface must also redirect photogenerated carriers within the time window set by intrinsic relaxation. This presentation examines how interface chemistry, electrostatic bias, and ultrafast dynamics can be connected to establish a productive interfacial rate hierarchy in TiO_2/CdS photocatalysts. Sulfur-supply programming reconstructs the oxide/sulfide contact while largely preserving bulk CdS loading, allowing interface-formation effects to be distinguished from changes in absorber content. Photoelectron spectroscopy and phase-sensitive surface photovoltage identify an electrostatically favored junction within a finite chemical-reconstruction window, showing that chemical accessibility alone does not determine catalytic performance.

Femtosecond transient absorption measurements in the lactic-acid reaction medium reveal progressively faster early spectral evolution from pristine CdS through a composition-matched physical mixture to the in situ formed heterojunction. Integrated transient-signal and spectral-weight analyses establish this ordering independently of exponential model selection, while global analysis provides effective few-picosecond timescales of approximately 4, 3, and 2 ps, respectively. These results place interface-associated redistribution within the same temporal window as native CdS relaxation.

Crucially, the accelerated response is accompanied by enhanced photovoltage, preferential Pt photodeposition on CdS-rich regions, stronger superoxide and hydroxyl radical signals, and increased hydrogen evolution. Together, these observations support productive, redox-preserving carrier sorting within an S-scheme framework and argue against unproductive carrier loss as the dominant origin of the faster response. Under simulated AM 1.5G irradiation with lactic acid as a sacrificial donor, the optimized catalyst achieves an H_2-evolution rate of 10.1 $mmol \cdot g^{-1} \cdot h^{-1}$, 12.6 times that of pristine CdS. The resulting design principle links chemical accessibility, electrostatic selection, kinetic competition, and redox functionality, providing an experimentally testable framework for engineering buried photocatalytic interfaces beyond static band diagrams.

Enhanced Functional Surface Induced by Laser Micro/Nano - Manufacturing for Environmental Applications

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ABSTRACT

This talk explores the applications of laser micro/nano-manufacturing in environmental engineering, with particular emphasis on oil/water separation and photocatalytic degradation. Characterized by high precision, high processing speed, flexible patterning, and excellent reliability, laser processing provides a versatile platform for constructing functional surfaces, hierarchical micro/nanostructures, and catalytic materials. For oil/water separation, laser-ablated copper meshes with tailored wettability achieve high separation efficiency and robust resistance to acidic, alkaline, and saline environments. Further functionalization with graphene oxide, CuO nanowires, or ZnO-based heterostructures enhances interfacial wettability, structural adhesion, catalytic activity, and cyclic stability. Laser-textured CuO nanowire systems can maintain high photocatalytic degradation efficiency over repeated cycles, while piezo-photocatalytic ZnO@Cu architectures combine underwater superoleophobicity with efficient oil/water separation and organic-pollutant degradation, demonstrating the potential for integrated treatment of complex wastewater. More recently, picosecond-laser-perforated Ti membranes integrating CuO/Cu/TiO_2 ternary heterostructures have demonstrated geometry-dependent photoelectrocatalytic behavior. Square microholes promote catalyst enrichment at edges and corners, enhance interfacial charge transfer and local mass transport, and achieve approximately 66% total organic carbon removal while maintaining stable performance during repeated filtration–backwashing cycles. In addition, diffractive optical element (DOE)-based beam shaping offers a promising route for scalable fabrication of metallic microporous membranes. By reconstructing the optical field, laser intensity can be precisely tailored to produce complex microchannels and highly uniform microhole arrays with controlled geometry and periodicity, improving processing consistency, throughput, and structural controllability for advanced water-treatment membranes.

Green Separation and Value-Added Recycling of Photovoltaic Waste

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ABSTRACT

The rapid expansion of crystalline-silicon photovoltaics is creating a growing stream of end-of-life modules containing valuable glass, silicon, silver, copper, aluminum, and polymeric materials. This presentation introduces an integrated recycling framework spanning green delamination, conversion of encapsulants and backsheets, selective recovery of metals, and value-added utilization of recovered silicon. A choline-chloride-based ionic liquid enables efficient swelling and separation of laminated modules, achieving an EVA separation ratio of approximately 100% and maintaining more than 98% after ten reuse cycles. Subcritical water provides a reagent-free alternative for delamination. Controlled-oxygen pyrolysis reduces residual carbon to below 0.1% while suppressing oxidation of valuable metals. The resulting organic vapors can be catalytically converted into carbon nanotubes with a conversion above 70% and hydrogen-rich gas containing more than 72.5% H_2. After delamination, hydrometallurgical etching, vacuum directional solidification, and vacuum distillation enable the separation and purification of silicon and metals. Directional solidification removes approximately 94.39% of the impurities from recovered silicon wafers, yielding silicon with a purity of about 5N, while lead, silver, and zinc are recovered at purities of 99.8%, 97.5%, and 97.0%, respectively. Recovered silicon powders are further upgraded into high-performance battery materials. Multimetal removal exceeds 90%, producing regenerated silicon with a purity above 99.98%. Waste-silicon-derived SiO reaches a conversion above 95%, and binder-assisted spray granulation produces spherical silicon-carbon particles with a yield above 90% and a compressive strength of 150 MPa. Amorphous silicon-nanowire/carbon composites deliver 2569 mAh g^{-1} with an initial Coulombic efficiency of 90%, retain approximately 96% capacity after 500 cycles. These advances provide a full-chain pathway for cleaner photovoltaic recycling and high-value circular utilization.

Forum 3: Optoelectronic Functional Materials and Integrated Photonics

Integrated Optical Communication and Sensing: Techniques and Applications

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ABSTRACT

In recent decades, a comprehensive network of land-based and underwater optical communication fibers has been established to meet the global demand for connectivity. Lately, there has been increasing interest in using this existing infrastructure for environmental sensing to monitor changes in the physical environment. This interest is fueled by two primary factors: the widespread geographic coverage of optical communication fibers and their high sensitivity to optical detection, which together offer a range of previously unattainable sensing capabilities. These capabilities include the development of extensive networks for monitoring seismic activity, transportation systems, and more. Additionally, integrating sensing functions can greatly improve the reliability of the current optical network. In this presentation, we will explore recent advancements in combining optical communication and sensing technologies and discuss some application examples as well requirement for realizing integrated photonic platform for such systems.

Topological-cavity surface-emitting laser

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ABSTRACT

Semiconductor lasers are the workhorse of information technology. Their single-mode operation is built on one-dimensional periodic gratings: adding optimized defects to such gratings yields today's mainstream sources, phase-shifted DFBs for fiber telecommunication and VCSELs for face recognition. Yet the single dimension of these designs caps their single-mode power and beam quality, forcing array integration and bulky lens optics; moreover, high power from the edge-emitting DFB is limited by its facets, while the VCSEL is locked to the wavelengths of its material system and cannot form monolithic multi-wavelength arrays. Japan's photonic-crystal surface-emitting laser (PCSEL) extends mode selection to two dimensions but remains a periodic design. In this talk, I will introduce the topological-cavity surface-emitting laser (TCSEL) [1-3], a two-dimensional topological defect design whose unique zero mode is non-degenerate in both frequency and polarization, enabling stable single-mode lasing at large apertures - free of the facet and material-system constraints above. These devices directly address current applications such as LiDAR and AI optical interconnects, and in doing so give topological physics, after three Nobel prizes, its long-sought device exit.

From Optoelectronic Nonlinearity to Femtojoule All-Optical Activation: 2D-Material-Integrated Silicon Photonics for Optical Computing

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ABSTRACT

Silicon photonics offers a scalable and CMOS-compatible platform for high-throughput optical computing, yet its relatively weak intrinsic nonlinearity remains a major challenge for implementing compact, low-power, and programmable nonlinear operations. In this talk, I will present our recent efforts in integrating two-dimensional materials with silicon photonic circuits to introduce new nonlinear functionalities for optical computing and neural networks.

We first demonstrate graphene/silicon heterojunctions that simultaneously perform optical modulation and photodetection, enabling reconfigurable, phase-relevant nonlinear activation functions for coherent optical neural networks. The joint modulation–detection functionality provides programmable amplitude and phase responses within a compact device and supports complex-valued neural-network processing. We further explore multifunctional optoelectronic nonlinear processing by integrating black phosphorus with multiple silicon waveguides, realizing linear and nonlinear logic operations, including XOR and XNOR, at telecom wavelengths. These devices also enable cascaded logic and application-level demonstrations such as symbol recognition, edge extraction, image fusion, and encryption/decryption.

Moving beyond optoelectronic nonlinearities, we finally demonstrate ultrafast all-optical nonlinear activators based on graphene-integrated silicon photonic-crystal cavities. By combining graphene saturable absorption, silicon Kerr nonlinearity, and cavity-enhanced light–matter interaction, the devices achieve a 4-fJ saturation threshold with a 1.05-ps response time, together with reconfigurable nonlinear activation at a 30-fJ threshold and picosecond-scale response. ReLU-like, sigmoid-like, and linear-like activation functions can be generated within an approximately 15 × 10 μm² footprint.

These results highlight how 2D-material/silicon heterointegration can bridge device physics and computing architectures, providing a promising route toward ultrafast, energy-efficient, and highly integrated photonic neural networks.

Topological insulator plasmons for enhanced light-matter interactions

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ABSTRACT

Surface plasmons, light-driven oscillation of free electrons along the conductor-dielectric interface, play a crucial role in the light-matter interactions, optical sensing, light control, photonic integrated devices due to the subwavelength-scale light confinement, near-field enhancement, and beyond the diffraction limit of light. Surface plasmons are usually generated in the nanostructures based on noble metals (e.g. gold and silver), which face some drawbacks (e.g. large loss, narrow frequency range, poor tunability, etc). It is necessary to explore new materials for plasmonic generation and applications. Recently, the novel nanomaterials have provided exciting opportunities for the development of plasmonics and related technologies. Topological insulator (TI) materials as new-emerging quantum state of matter were found to support the excitation of surface plasmons in an ultrawide operating frequency range from ultraviolet to terahertz with advantages of tunability, integration, lower loss at high frequency, etc. TI materials with these properties will offer a promising pathway for light control and novel plasmonic functionalities. In this talk, I will introduce some recent progress of our research about TI-based plasmonic generation (e.g. magnetic plasmon resonance, surface plasmon resonances, Tamm plasmons, etc) and applications in enhanced light emission, third harmonic generation, photodetection, etc.

Zero-spacing waveguide systems and photonic parallel spaces

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ABSTRACT

Miniaturization and high-density integration are one of the main issues in modern science and technology. Similar to Moore's Law in semiconductor industry, photonic chips of denser integration are highly desired for smaller footprints and higher speed. Two potential routes forward are 1) removing the claddings, therefore enabling zero-spacing waveguide systems, and 2) allowing multiple optical devices to occupy the same physical space without interference, like parallel spaces. In this talk, I will review some progress of meta-waveguide systems in these two directions. In the past few years, we have demonstrated practical techniques to completely remove the claddings of waveguides, or effectively realize photonic parallel spaces—overlapping photonic devices that work independently as if existing in different dimensions. These amazing phenomena enable 100% space utilization efficiency on chips as well as functional multiplexing within the same space, opening a pathway toward ultra-compact, multi-functional photonic architectures for next-generation information systems.

Colloidal quantum well light-emitting diodes and their extended applications

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ABSTRACT

Colloidal quantum well light emitting diodes (CQW-LEDs) are highly promising for the new-generation displays, lighting, and optical communication technology, because they can exhibit high efficiency, good color purity, low power consumption, fast response, ultrathin thickness, ultralight weight, flexibility, and other excellent properties. Although the exploration of CQWs in LEDs is impressive, the performance of CQW-LEDs lags far behind compared with other types of LEDs (e.g., organic LEDs, colloidal quantum-dot LEDs, and perovskite LEDs). Herein, in order to further improve the performance of CQW-LEDs, different methods are used to control the distribution of charge and exciton in CQW-LEDs. The influence of charge injection and transport, morphology, material composition, device engineering, and other factors on the performance is deeply clarified. As a result, a series of high-performance CQW-LEDs are developed, and the external quantum efficiency of CQW-LEDs can exceed 20%. Additionally, integration properties of CQW-LEDs have been demonstrated. Finally, the concepts, strategies, and design principles have been extended for other kinds of optoelectronic (e.g., perovskite LEDs, quantum-dot-electrolyte LEDs, and organic LEDs) and microelectronic devices and integrated applications.

Micro-structured optical fiber and it's applications for UV light generation and mid-IR light delivery

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ABSTRACT

Micro-structured optical fiber, that can guide light in its hollow core, is a good platform for generating and delivering ultrafast light pulses at some special wavelengths that conventional silica-core fibers are not transparent. In this talk, we will present some recent work of our lab in this direction, including tunable UV light generation in hollow-capillary waveguide and mid-IR ultrashort pulse delivery in hollow-core micro-structured fiber.

Multidimensional control of laser emission for semiconductor photonic crystal microlasers

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ABSTRACT

Semiconductor lasers have diverse applications spanning precision metrology, optical communications, imaging, manufacturing, and biomedicine. As these devices move toward on-chip and system-level integration, monolithic control of coherent light emission without relying on bulky external components is becoming increasingly important. Two-dimensional photonic crystals provide a compelling platform for this purpose, offering rich physical and geometric degrees of freedom for manipulating light. When integrated with conventional III–V gain materials, they enable the co-design of light generation and emission control on a single substrate, opening new opportunities for improved performance, enhanced functionality, higher integration density, programmability, and scalability of on-chip light sources. In this presentation, I will discuss our recent efforts to harness the rich physics of photonic crystals—including band topology and polarization singularities—together with geometric degrees of freedom, such as structural symmetry and synthetic dimensions, to achieve multidimensional control of semiconductor laser emission. Specifically, I will highlight our progress in three key aspects: enhancing surface-emission power while reducing the lasing threshold; developing multiscale strategies for precise wavelength control, from coarse tuning to fine spectral manipulation; and realizing high-purity linearly and circularly polarized laser emission. Together, these advances illustrate the potential of photonic-crystal engineering for the integrated control of the power, wavelength, and polarization of semiconductor lasers.

Hybrid integrated quantum photonics and its prospects for quantum applications

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ABSTRACT

Hybrid-integrated photonic chips enable the integration of key functional quantum photonic components—including solid-state artificial-atom photon sources, ultrafast electro-optic modulators, and superconducting single-photon detectors—on a single chip, and are emerging as a leading platform for scalable and multifunctional optical quantum technologies. However, achieving efficient hybrid integration of solid-state quantum emitters with low-loss photonic circuits in cryogenic environments, together with realizing multiphysics quantum control of solid-state artificial-atom systems on cryogenic photonic chips, remains a major challenge in the field.

This report focuses on the hybrid integration of high-performance quantum-dot single-photon sources and on-chip cavity quantum electrodynamics (cQED). We discuss heterogeneous multi-material chip-integration technologies, the precise engineering of cQED systems based on in-plane localized optical modes, as well as on-chip quantum interconnects and non-Hermitian single-photon control in hybrid-integrated quantum photonic chips. By enabling multiple quantum dots on a single chip to simultaneously generate indistinguishable photons, this approach has the potential to overcome the photon-number scalability bottleneck inherent to existing active demultiplexing schemes based on a single quantum dot, thereby laying the foundation for large-scale, cryogenically operated hybrid-integrated quantum photonic chips.

Metasurface-enabled Multidimensional Light Field Manipulation for Advanced Imaging and Optical Information Processing

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ABSTRACT

Metasurfaces—planar arrays of subwavelength electromagnetic structures—enable precise control of the amplitude, phase, polarization, and spatial distribution of light within an ultrathin form factor. By integrating multiple optical functionalities into a single planar element, metasurfaces offer a promising route toward compact, multifunctional optical systems for next-generation imaging technologies. In this talk, I will present our recent progress in metasurface-enabled multidimensional light-field manipulation for advanced imaging and optical information processing. By tailoring the complex optical responses in different polarization channels, a monolithic metasurface can integrate conventional high-resolution imaging with spatial differentiation. Such devices directly extract image features—including edges, contours, and other spatial variations—during image formation, enabling in situ, full-field optical information processing without bulky 4f systems or additional optical modules. I will present several representative implementations that provide isotropic two-dimensional edge enhancement, arbitrary-order spatial differentiation, and direction-tunable edge detection. Together, these devices span operating wavelengths from the ultraviolet to the near-infrared and support applications including live-cell imaging, pathological examination, and defect detection.

Exploring Chiral Exceptional Lines of normal photonic crystals in the Visible Regime

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ABSTRACT

This report takes our recent work intrinsic topological structures embedded in normal photonic structures, chiral exceptional lines. Using a self-built frequency- and momentum-resolved Mueller matrix ellipsometry system, we directly observed chiral exceptional lines in a three-dimensional parameter space on a simple grating structure, verifying their robust presence over a broad frequency band and the enhanced sensing sensitivity enabled by the square-root response. These exceptional lines exhibit an intrinsic selective response to left- and right-handed circularly polarized light, providing a new physical basis for label-free chiral molecular sensing, circularly polarized light detection and routing, and interference-immune topological photonic devices. More importantly, this scattering-matrix framework is universal: from metallic gratings to all-dielectric metasurfaces, and from the visible to the mid-infrared, it can support the same class of topological singularities.

Nanostructure Lattices and Their Nanophotonic Devices

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ABSTRACT

Nanophotonic structures can confine light into subwavelength volumes with enhanced local electromagnetic fields important for light–matter interactions in nanophotonics, sensing, and nonlinear physics. Lattice-based architectures can significantly expand the design freedom for engineering these interactions and lead to unparalleled scientific and technological advances, which are not readily feasible through conventional processing and metrology techniques. In this talk, we will share our recent progress on design and device demonstration of nanostructure lattices with tailored optical responses, including: (1) high-quality lattice resonances enabled by structural design and their electrical tuning methods, (2) nanophotonic lattices for spatially unified lasing, tunable lasing, and flexible nanolasers, and (3) plasmonic nanoparticle lattices for high-performance optical sensing devices.

Integrated Photonics for Distributed Coherent Radar Systems

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ABSTRACT

As a prominent architecture for next-generation radar systems, distributed coherent radar leverages multi-node spatial coordination and optical synthesis to achieve orders-of-magnitude improvements in detection range, angular resolution, and anti-jamming capabilities. However, its practical deployment is strictly constrained by technical bottlenecks, including ultra-high-precision time-frequency synchronization among spatially separated nodes, low-phase-noise signal dissemination over long distances, and dynamic wideband signal processing. Microwave photonics, offering unprecedented advantages such as ultra-wide operational bandwidth, immunity to electromagnetic interference, low transmission loss, and phase stability, delivers a transformative physical mechanism to address these critical challenges.

This invited presentation will systematically overview recent advances and state-of-the-art strategies in microwave photonics tailored for distributed coherent radar architectures. Key focus areas include picosecond-level phase-stabilized RF transfer over optical fiber networks, low-phase-noise signal generation assisted by optical frequency combs and optoelectronic oscillators. Furthermore, scalable on-chip photonic integrated circuit architectures, utilizing thin-film lithium niobate, silicon photonics, and III-V photonics, will be highlighted as promising pathways to miniaturized and energy-efficient transceivers. Finally, practical implementation cases in large-scale distributed radar arrays will be discussed to demonstrate the feasibility of these technologies. By bridging advanced optoelectronic integration with complex microwave system demands, this talk outlines a roadmap toward highly coherent, intelligent, and networked radar sensing networks.

High-dimensional OAM tailoring and processing

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ABSTRACT

Since the high-dimensionality of orbital angular momentum (OAM), one beam can carry multiple various OAMs simultaneously, forming a comb function in OAM domain as an OAM comb, therefore leading to applications like large-capacity laser communications, rotation detection, and quantum information. A high-dimensional OAM laser source is critical for above scenarios. In this talk, I will share recent advances of our team regarding high-dimensional OAM sources. In addition, I will also introduce our recent results in high-dimensional OAM processing like OAM filter and reconstructor, and also the exploration of employing high-dimensional OAM in secure one-to-many multicasting.

Optical Imaging in Scattering Environments — Imaging Model and Its Limits

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ABSTRACT

In foggy and underwater environments, optical imaging suffers from severe image degradation due to scattering effects. From the perspective of image signals, the main challenge lies in the low contrast and signal-to-noise ratio of the images. This report, from a signal standpoint, attempts to incorporate factors involved in reading out image signals into the traditional detection-based imaging physical model, thereby establishing an optical imaging model for low-visibility environments. The model comprehensively accounts for target characteristics, optical systems, imaging chain properties, and visual perception, enabling the derivation of imaging discriminability, visibility range limits, and their influencing factors independent of image algorithms. Once this physical limit is exceeded, simple digital image processing methods can no longer reconstruct image information. The imaging model was experimentally validated in both standard laboratory environments and field environments, with imaging data of resolution charts recorded. To verify the universality of the model, methods for expanding various imaging boundaries were further explored under the guidance of the physical model. The theoretical model shows excellent agreement with experimental measurements and successfully predicts the existence of imaging discriminability limits under different scattering environments.

Forum 4: Interdisciplinary Forum

Correlated Imaging with Multiple Optical-Field Degrees of Freedom via Nanocrystal-Material Modulation

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ABSTRACT

Correlated imaging refers to imaging techniques based on high-order correlation detection of optical fields. By combining multi-degree-of-freedom (DoF) manipulation of light fields, it enables imaging detection of multi-dimensional information of targets, including polarization, phase, and spectrum. This talk will introduce the fundamental principles of quantum detection in correlated imaging and a series of works on its applications in multi-dimensional light-field imaging. In this presentation we will focus on the interdisciplinary integration between correlation imaging and nanocrystal materials. First we will start from introduction of the fundamental principle of correlation imaging. We will briefly introduce the development of correlation imaging in multiple degree of freedom of optical field. Finally, we will discuss the combination of correlated imaging with nanocrystal materials. By exploiting the multi-DoF light-field manipulation of colloidal nanocrystals for light-field encoding and modulation, we propose a series of new methods including hyperspectral imaging, spectral–spatial correlated imaging, and joint spectral–polarization imaging.

Photonic glass and applications

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ABSTRACT

With the rise of glass packaging, glass has become an important material system for optical chips. Our team has focused on the structural regulation of optically functional glass and its applications in optical chips. We have discovered new mechanisms of ultrafast laser-induced micro/nano structuring in glass, developed a methodological framework for localized chemical reaction control, achieved continuous tunability of emission wavelengths over a broad range (480–700 nm) in glass microregions and continuous-wave single-mode random lasing, and fabricated three-dimensionally tunable micro/nano luminescent structures and devices within glass chips. We have developed deep-learning-driven ultrafast laser beam shaping techniques, addressed the longstanding challenge of high waveguide loss caused by refractive index mismatch, fabricated ultrabroadband low-loss glass optical waveguides, and established a new framework for topologically protected localized light transmission. We have also developed a novel method for ultrafast laser-induced local temperature gradient–assisted structural regulation of glass, constructed glass optical waveguides stable at high temperatures (1100 °C), proposed an end-face integration architecture, broken through the integration bottlenecks of micro/nano light sources and optical modulation structures with optical waveguides, and created active–passive integrated devices and nonlinearly modulated glass optical chips.

Photon-Counting Micro-CT: From Spectral Imaging to Quantitative 3D Characterization of Complex Materials and Biological Systems

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ABSTRACT

Photon-counting micro-computed tomography (PC micro-CT) is an emerging X-ray imaging technology that provides high-resolution three-dimensional visualization together with energy-resolved spectral information. Compared with conventional micro-CT using energy-integrating detectors, photon-counting detectors enable multi-energy imaging, virtual monoenergetic reconstruction, and material decomposition, offering new opportunities for quantitative characterization of complex heterogeneous structures.

In this study, we developed a photon-counting micro-CT platform and explored its capability as an advanced three-dimensional characterization technique for complex materials and biological systems. The imaging system integrates a photon-counting detector with optimized acquisition strategies and spectral reconstruction algorithms to achieve high-resolution structural imaging and material-specific analysis. By utilizing energy-dependent attenuation characteristics, spectral information was extracted to distinguish different components and provide quantitative insights beyond conventional grayscale imaging.

The developed approach was applied to various representative samples, including heterogeneous materials and biological specimens with complex hierarchical structures. The results demonstrated that photon-counting micro-CT can simultaneously reveal three-dimensional morphology and compositional variations, enabling improved visualization of interfaces, internal structures, and multi-component distributions. Compared with conventional attenuation-based imaging, spectral analysis provided additional contrast mechanisms for material differentiation and quantitative evaluation.

These results highlight the potential of photon-counting micro-CT as a powerful non-destructive characterization tool for advanced materials research, biomedical imaging, and multidisciplinary applications. By bridging photon-counting detector technology, spectral imaging, and three-dimensional quantitative analysis, this approach provides a new platform for investigating complex structures across multiple spatial scales.

Bioinspired Extraction of Critical Metal Resources

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ABSTRACT

Critical metal resources, including rare earth elements, uranium, and lithium, are increasingly important for economic development and the transition to new energy systems. Their extraction commonly relies on hydrometallurgical processes. However, conventional solvent extraction consumes large quantities of organic solvents and may cause environmental pollution, while adsorption-based processes are often discontinuous and inefficient. Membrane separation offers an efficient and potentially greener alternative, but achieving high selectivity remains challenging in harsh feed solutions containing high concentrations of chemically similar competing ions. In nature, biological ion channels overcome analogous challenges through precise chemical coordination and cooperative multi-ion interactions. Inspired by these biological systems, we design and regulate biomimetic ion-channel interfaces and investigate their selective sieving behavior under single-ion and multi-ion competition. For lithium recovery from seawater and salt-lake brines, we developed potassium-channel-inspired membrane interfaces and proposed a reverse-rejection transport strategy, which enables complete retention of lithium ions while allowing various competing ions to permeate through the membrane. For the extraction of critical heavy-metal resources, we further developed a general membrane separation strategy inspired by calcium ion channels. By enhancing the selective adsorption, interfacial occupancy, and channel transport of target ions, this strategy enables the efficient, environmentally sustainable, and selective extraction of strategic heavy-metal resources, including uranium, rare earth elements, copper, and gold. Together, these studies provide a versatile bioinspired platform for separating strategically important resources from complex aqueous environments. They further illustrate how biological transport principles can guide the design of membrane interfaces that integrate molecular recognition with continuous ion transport, providing a mechanistic basis for developing selective, continuous, and greener processes for critical-metal recovery.

Optical skyrmions in single microcavities formed by photonic spin-orbit coupling

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ABSTRACT

Fabry-Perot (FP) microcavities with metal or DBR (distributed Bragg reflector)-coated mirrors provide an excellent platform for investigating the collective behavior of confined 2-dimensional photons and polaritons. The TE-TM mode splitting in such cavities acts as an effective magnetic field, leading to photonic spin-orbit (SO) coupling effect that the pseudospin of cavity photons changes anisotropically with their momenta. Such mechanism has led to interesting observations including optical spin-Hall effect, magnetic-monopole-like half solitons, spinor condensate with half-quantum circulation, and polaritonic topological insulators. In recent years, we report the direct measurement of the Berry curvature and quantum metric in anisotropic organic microcavities, which leads to divergent quantum metric at Voigt exceptional points and dual lasing of orthogonal polarization by polariton relaxation via the imaginary Fermi Arics.

Furthermore, by analyzing the photonic SO coupling mechanism with the perturbation theory of Hamiltonians, we predict that in fully confined systems the eigenstates of the second excited manifold under TE-TM splitting are degenerate skyrmions which can be selected and manipulated by the non-Hermitian properties. This theory was experimentally demonstrated by coupling the microcavity with a single quantum dot. We further explore how the evolution of the skyrmions wavefunction with non-Hermitian gain and loss, highlighting the special properties at the exceptional points.

Design and Application of Intelligent Protective Coatings for Harsh Marine Environments

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ABSTRACT

To meet the national major demand for long-term service of marine engineering equipment under harsh environments, a composite material system consisting of low-copper heterojunctions and smart responsive microcapsules loaded with green antifoulants has been developed. The heterojunction photocatalysis generates bioactive species to accelerate biofilm degradation. By sensing the microenvironmental changes of biofilms, the microcapsules achieve gradient targeted release of antifoulants during biofilm formation and development, enabling adaptive, cyclic and stable controlled release across different sea areas. The synergistic effect of the two components interferes with biofilm growth. High-efficiency antifouling performance is maintained even with a 30% reduction in antifoulant dosage, addressing the drawbacks of conventional antifoulants such as excessively fast release and low static antifouling efficiency.

Matching with the supporting primer, self-healing materials with regulated two-dimensional nanosheet/spherical multi-level structures have been developed. By tuning the sensitization kinetics of 2D nanosheets and spheres towards healing agents within the coating, rapid response of the coating is realized, with the self-healing efficiency raised to over 95%. This overcomes the accelerated coating failure caused by externally induced microcracks and delamination, and establishes a novel long-term anticorrosion strategy featuring synergistic "barrier-passivation-inhibition" effects.

Fading-Resilient and High-Sensitivity φ-OTDR Enabled by Polarization and Frequency-Domain Signal Fusion

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ABSTRACT

Distributed acoustic sensing (DAS) is highly susceptible to performance degradation when the Rayleigh backscattered signal is weak and affected by scattering-induced fluctuations. In particular, coherent and polarization fading can cause severe signal attenuation, resulting in sensing dead zones and compromising the accuracy and stability of phase demodulation. These limitations become more pronounced in low-signal-to-noise ratio (SNR) environments. To improve the sensing performance under such conditions, a polarization fusion-based frequency division phase-matching (PFDPM) scheme is developed for DAS. Polarization-diversity signals are first collected and processed through frequency-division phase matching, after which their complex vectors are coherently combined to recover phase information from fading-affected signals. An adaptive weighting strategy is further incorporated into the phase-matching and vector-combination procedures, allowing the contributions of different signal components to be adjusted according to their phase consistency and quality, thereby reducing noise introduced during phase extraction. To address the limitation imposed by insufficient backscattered power, femtosecond-laser-inscribed scattering points are also investigated as a means of increasing local Rayleigh backscattering and improving the available sensing signal. Meanwhile, spatiotemporal constraints are introduced into phase demodulation to maintain phase continuity and improve the reliability of phase unwrapping in low-SNR regions. A phase correction procedure is additionally employed to compensate for phase discontinuities and extend the measurable strain range. Experimental measurements of a PZT positioned 1 km from the sensing system demonstrate successful strain recovery, with an SNR improvement of 5.48 dB relative to a conventional DAS scheme. The combined approach enhances the available backscattered signal, reduces the influence of polarization and coherent fading, and improves the robustness of phase recovery, demonstrating its potential for long-range distributed optical-fiber sensing.

Non contact non destructive coating thickness measurement

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ABSTRACT

With the development of surface technology, more and more products in the production process through the coating, plating and other surface treatment process to achieve specific functions, and the thickness of the coating directly determines the final quality of these products. The traditional contact or destructive coating thickness measurement technology are very often restricted in materials and mostly not suitable for automatic coating process control. There is a strong and urgent need of fast, accurate and non-destructive coating thickness measurement technology and equipment. With patented photothermal and terahertz technology, AIM Systems successfully covered this unmet need. This presentation will bring insights of the non-destructive coating thickness measurement technology and validated applications from AIM Systems.

Light-field manipulation and control based on metasurfaces and metalenses

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ABSTRACT

Metasurfaces enable flexible manipulation of the phase, amplitude, and polarization of light at the subwavelength scale, establishing them as a powerful platform not only for generating and controlling complex structured light fields but also for overcoming the intrinsic limitations of conventional lenses in imaging performance. Leveraging this capability, this work first investigates the on-demand generation and control of structured light fields. By constructing the required phase profiles on metasurfaces, we achieve flexible generation and manipulation of multiple structured light fields, including Bessel beams, Airy beams, and perfect vortex beams. We further extend the study to topological light fields such as skyrmions and bimerons, demonstrating fundamental generation, transmission and reflection control, and on-chip four-channel generation. Meanwhile, this flexible manipulation capability can be readily extended to imaging. To address the efficiency and accuracy bottlenecks of metalenses in wide-field and broadband imaging, we propose a radially gradient tilted meta-atom array that introduces the tilt angle as a new design degree of freedom, significantly enhancing focusing efficiency and imaging accuracy over a 120° ultra-wide field of view. Furthermore, by combining an evaluation-driven inverse design method with array dimensionality reduction, the work integrates wide-field and broadband achromatic functionality into a single metalens, enabling diffraction-limited focusing and subwavelength-resolution imaging. This work establishes a complete manipulation chain from complex light-field generation and control to high-performance imaging, offering new insights for designing integrated optical manipulation devices.

Inorganic Functional Nanomaterials for Tumor Immunotherapy

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ABSTRACT

Malignant tumors pose a significant threat to human health, with over 90% of tumor-related deaths attributed to metastasis. How to overcome the immunosuppressive tumor microenvironment and tumor metastasis is the main challenge. In this context, we have designed a range of nanocomposites to address the aforementioned challenges.

(1) A multifunctional immunomodulator is engineered for near-infrared light (NIR)-triggered photodynamic-metal-metabolic immunotherapy. An endogenous and exogenous stimuli-responsive nanoagent was prepared using chlorin e_6 (Ce_6)-modified dense silica-coated rare earth-doped nanoparticles (ReNPs@SiO_2(Ce_6)), with ZIF-8 grown in situ on the surface for loading two energy inhibitors. This material induced energy depletion by inhibiting glucose transport and glutamine metabolism, while mitochondrial damage under NIR irradiation released mtDNA, synergistically activating the cGAS-STING pathway with Zn^{2+}, initiating type I interferon responses, and reshaping the tumor immune microenvironment.

(2) Pre-metastatic niches (PMNs) play a prerequisite role in metastasis, and blocking their formation is vital to inhibiting tumor cell spread. An oxygen-independent NIR-triggered multiple-phototherapy nanoplatform was designed using orthogonal UCNPs modified with dual photosensitizers. Under 808/1550 nm excitation, ROS was generated to achieve normoxic/hypoxic-compatible phototherapy, directly killing tumor cells and depleting CAFs. Meanwhile, surface-coated copper-shikonin induced cuproptosis-pyroptosis and released damage-related molecular patterns, thereby alleviating immune suppression and blocking the formation of PMNs.

(3) A "metal chelation therapy" method has been proposed. D-penicillamine coordinated with Zn^{2+} to form Zn-PEN, which depleted copper in tumor cells and promoted Zn^{2+} accumulation, achieving synergistic antitumor, antibacterial, and antimetastatic effects. Furthermore, EDTA-Mg was designed to chelate Ca^{2+} on tumor-cell surfaces, artificially initiate epithelial-mesenchymal transition, and subsequently chelate ferritin-derived Fe^{2+}, promoting lysosomal rupture and ferroptosis through Fenton-like reactions. Ferroptosis combined with Mg^{2+} release synergistically enhanced immune responses inhibited tumor metastasis.

Contact Electrification Induced Interface Spectroscopy and the GaN Laser Diodes

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ABSTRACT

I would like to report the multiphase interatomic electron transfer and GaN material and devices. The report will start with the introduction of the developments in the third-generation semiconductor and Contact Electrification Induced Interface Spectroscopy (CEIIS). It covers from the basic principles to the typical field applications. Firstly, I will introduce the developments on GaN material and devices and their relations with Piezo-Phototronics Effects. Next, I will focus on an emerging field – CEIIS. We observed the atomic featured photon emission spectra during CE between two solid materials for the first time. The photon emissions are the evidences that electrons transfer takes place at the interface from one atom in one material to another atom in the other material during CE. Three possible physical processes are suggested for understanding the photon emission arising from the electron charge transferred in CE: CE induced electron to transit (i) to a lower energy level in one atom by emitting a photon; (ii) to the excited state of another atom through energy resonance transfer, followed by transiting to a lower energy level of the atom; and (iii) to a lower energy level in another atom, followed by transiting to an even lower energy level by a photon. It occurs through energy resonance transfer when atoms from different materials are brought close with each other. It conveys a wealth of information about the energy structure at the interface and naturally paves a way to a spectroscopy corresponding to the contact-electrification at an interface, which might have fundamental impacts to understand the interaction among solids, liquids and gases. Although we only focused on photon emission in CE for solid-solid case in this study, it could be expanded to Auger electron excitation, X-ray emission and electron emission in CE for general cases, which remain to be explored.

Abstracts of Invited Talks and Oral Talks

Forum 1: Nano-Functional Materials

Photothermal conversion and thermal storage properties of graphene and MXene based aerogel confined inorganic phase change materials

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ABSTRACT

Efficient solar-energy harvesting and thermal energy storage constitute one of the key technologies for achieving carbon-neutrality goals. Inorganic phase-change materials (e.g., hydrous salts and molten salts) have attracted considerable attention owing to their high thermal-storage density and low cost. Nevertheless, their inherent drawbacks including poor thermal conductivity, easy leakage and substantial supercooling severely limit their practical applications. In this study, three-dimensional porous aerogels constructed from two-dimensional materials such as reduced graphene oxide (rGO) and $Ti_3C_2T_x$ MXene are proposed as confinement skeletons to encapsulate inorganic molten-salt phase-change materials ($LiNO_3$, $NaNO_3$-KNO_3, LiF-NaCl-Li_2CO_3, etc.), yielding composite phase-change materials integrating photothermal conversion and thermal-energy storage. Functional modification of the aerogels is performed to tailor their surface groups, which endows the aerogels with high-temperature oxidation resistance under ambient-air conditions and provides stable “photon-harvesting-to-thermal-energy-conversion” functional units for high-temperature photothermal composite phase-change materials. By combining solvent-induced impregnation and PEG-assisted thermal-cycling interface-coupling treatment, high-performance high-temperature photothermal phase-change composites are fabricated with a photothermal-conversion efficiency higher than 91 % and tunable phase-change enthalpy ranging from 300 to 530 J/g. This work lays a material foundation for designing high-performance photothermal-storage devices and exhibits promising application prospects in solar-thermal management systems, energy-saving smart buildings and other fields.

Carbonized polymer dots luminescent materials

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ABSTRACT

As an emerging class of carbon-based luminescent nanomaterials, carbonized polymer dots (CPDs) hold significant promise for applications in optoelectronic displays, bioimaging, and solid-state lighting owing to their excellent optical properties, good biocompatibility, and tunable luminescence. Nevertheless, simultaneously achieving a high photoluminescence quantum yields (PLQYs) and narrow-band emission, while further advancing toward stimulated emission and lasing applications, remains a fundamental challenge and an important frontier in CPDs research. This work focuses on the rational modulation of CPDs luminescence and systematically elucidates the design strategies and underlying photophysical mechanisms for simultaneously achieving high PLQYs and narrow full-width at half-maximum (FWHM). Through rational precursor molecular engineering and optimization of synthetic conditions, non-radiative decay pathways were effectively suppressed, resulting in enhanced radiative recombination efficiency. By constructing highly ordered carbon cores and achieving a uniform distribution of surface states, CPDs with near-unity PLQYs and an FWHM below 20 nm were reproducibly obtained. More importantly, low-threshold lasing emission was successfully demonstrated using these high-performance CPDs, confirming their potential as solution-processable optical gain media. This work establishes a robust materials design framework for simultaneously enhancing luminescence efficiency and color purity in CPDs and further extends their potential applications to miniaturized, low-cost, and scalable solid-state lasers, thereby providing new opportunities for the development of next-generation optoelectronic light sources.

Tunable Diffractive Optical Elements on Single-Walled Carbon Nanotubes for Terahertz Wavefront Reconstruction

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ABSTRACT

Terahertz (THz) radiation is increasingly used for imaging, non-destructive testing, biomedical diagnostics, and ultra-fast communications. Unlike the visible range, dynamic control of THz wavefronts remains challenging due to the lack of widely accepted tunable optical elements. Single-walled carbon nanotube (SWCNT) films on elastomeric substrates are promising candidates for such systems: their conductivity can be tuned by gating and chemical doping, while mechanical strain allows the focal length to be adjusted [1–4]. Moreover, SWCNTs can be deposited on substrates to fabricate large-area elements of arbitrary shape (Fresnel and spiral zone plates, as well as metasurfaces), which is essential at THz wavelengths.

In this work, we experimentally demonstrate a new phase retrieval method based on a tunable lens made of SWCNTs on an elastomeric substrate. The method uses a series of intensity distributions recorded at a single fixed distance to the detector while the lens is mechanically strained from 0% to 18%. In contrast to conventional multiple-plane phase retrieval, the proposed approach replaces longitudinal detector scanning by adjusting the focal length of the lens, ensuring a compact and fast measurement scheme. As a proof of concept, we applied this method at 0.329 THz to retrieve the phase of the field formed by a spiral zone plate that acts simultaneously as a focusing lens and as the object under study, forming a triple-charge THz vortex beam.

The THz complex field was reconstructed during SZP stretching, and the calculated orbital angular momentum spectrum shows a dominant mode with topological charge l = 3, consistent with numerical simulations. The proposed method can be extended to a broader scheme in which an object is illuminated, and a tunable lens is used to recover the object's phase. This work is the first demonstration of such an object-plus-lens phase retrieval approach in the THz range using SWCNT-based elements.

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Reaction-Mediated Additive Engineering Enables Interfacial Coordination and Surface Defect Regulation in $Cs_3Cu_2Cl_5$ Nanocrystals

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ABSTRACT

Achieving simultaneous control over crystallization and surface defect chemistry remains a major challenge in low-dimensional Cu(I)-based metal halides, because defect-assisted nonradiative recombination arising from imperfect crystal growth severely limits their luminescence efficiency and environmental stability. Herein, we develop a microwave-assisted ultrafast strategy for the ambient synthesis of $Cs_3Cu_2Cl_5$ nanocrystals through reaction-mediated additive engineering, without reducing agents or inert-atmosphere protection. Systematic investigation of five representative additives reveals that acyl chlorides undergo nucleophilic substitution with oleylamine during crystallization to generate reaction-derived ligands while simultaneously releasing chloride species. Experimental characterizations combined with density functional theory calculations demonstrate that the reaction-derived ligands strengthen interfacial coordination, whereas the accompanying chloride species contribute to optimizing the surface stoichiometry, collectively suppressing defect-assisted nonradiative recombination without altering the intrinsic crystal structure. Among the investigated additives, 1,3,5-benzenetricarbonyl trichloride generates a unique monosubstituted ligand with the strongest ligand-surface interaction, yielding $Cs_3Cu_2Cl_5$ nanocrystals with a near-unity photoluminescence quantum yield of 98.53%, enhanced environmental stability, and excellent compatibility with printed luminescent films, phosphor-converted green light-emitting diodes, and luminescent solar concentrators. This work establishes a reaction-mediated additive engineering strategy for simultaneously regulating interfacial coordination and surface defect chemistry, providing a general route toward high-performance low-dimensional Cu(I)-based luminescent halides.

Forum 2: Advanced Energy and Environmental Materials

Research progress of electrode materials and their potassium storage mechanism for potassium-based energy storage devices

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ABSTRACT

The excessive use of fossil fuels sets the high standard for the development of next-generation energy storage devices. Potassium-based energy storage technology holds great promise for the large-scale and sustainable applications owing to its low cost and natural abundance. To this end, exploring high energy density and long cycle life electrode materials should be given the high priority. Meanwhile, understanding the fundamental reaction mechanism helps to promote the design of potassium-based full cells for commercial applications. This presentation aims to introduce the synthesis, improvement strategies and interface regulation of various electrode materials. Moreover, their structure and chemical evolution are revealed through cutting-edge characterizations. These results are expected to highlight the research progress on device design and interface optimization, which is beneficial to the development of the next-generation clean energy technology.

Interconnected Microporous Carbon for Boosted Capacitive Kinetics and Practical Application

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ABSTRACT

Achieving fast ion transport in thick and dense carbon electrodes is crucial for developing supercapacitors with simultaneously high energy and power densities. However, increasing electrode thickness and compaction density generally aggravates ion-transport limitations, making pore-structure design particularly important under practically relevant mass loadings. Herein, we demonstrate that rational design of microporous carbon structures can improve ion accessibility and charge-storage kinetics in thick electrodes. Building on these efforts, we recently developed an interconnected microporous carbon that integrates an ultrahigh specific surface area, high compaction density, excellent electrical conductivity, and robust mechanical strength. The interconnected micropores create continuous ion-transport pathways within individual carbon particles and, more importantly, sustain efficient ionic transport throughout thick and dense electrodes exceeding 100 μm in thickness. Electrochemical analyses reveal a distinct loading-dependent advantage: although the interconnected microporous carbon shows inferior rate performance to conventional hierarchically porous carbons at low mass loadings, it exhibits superior capacitive and kinetic performance as the mass loading increases. Under commercially relevant mass loading, the resulting electrode delivers simultaneously high gravimetric, volumetric, and areal capacitances, demonstrating the effectiveness of interconnected micropores in mitigating transport limitations in practical electrodes. These results clarify how pore connectivity at the particle scale can translate into enhanced ion-transport kinetics at the electrode scale. The systematic works highlight the critical role of micropore architecture, electrode density, and transport-pathway continuity in determining the practical performance of carbon-based supercapacitors. Kilogram-scale production of the interconnected microporous carbon has already been achieved, and ton-scale pilot production is currently underway, paving the way for its practical application as a key electrode material for high-performance supercapacitors.

Research on perovskite-based tandem solar cells

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ABSTRACT

Addressing the core bottleneck of insufficient long-term stability that hinders the industrialization of perovskite-based tandem solar cells, this report focuses on optoelectronic structure optimization and establishes a systematic framework spanning structural design, material design, device optimization, and flexible applications. Based on mainstream TOPCon technology, a novel micro-nano textured silicon structure compatible with industrial fabrication is developed, nanoconfinement effects are leveraged to enhance perovskite crystal quality, and doped polysilicon tunnel junctions are introduced to reduce subcell coupling losses, yielding high-efficiency perovskite/TOPCon tandem devices. To tackle stability issues under complex environments, the perovskite mechanical modulus and dielectric environment are modulated to mitigate photothermal stress corrosion and carrier accumulation, while in-situ internal encapsulation suppresses ion migration and interfacial mass exchange. For flexible applications, flexible perovskite/silicon tandem cells are realized on 30-μm ultrathin crystalline silicon, and the challenges of constructing high-quality perovskite top cells on rough CIGS surfaces and achieving multi-interface adhesion are overcome, enabling high-efficiency flexible perovskite/CIGS tandem devices. This work provides key technological support for the industrialization and diversified applications of highly stable, high-efficiency perovskite-based tandem solar cells.

In situ solidified electrolyte for lithium metal batteries.

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ABSTRACT

Lithium metal has a high theoretical specific capacity and a low electrochemical potential, making it an important anode material for constructing next-generation high-specific-capacity batteries. However, in traditional liquid electrolyte systems, there are issues such as interface side reactions, lithium dendrite growth, and continuous consumption of the electrolyte, which severely restrict the cycle life and safety performance of the battery. In situ cured electrolytes use low-viscosity precursors to fully infiltrate the electrode and pores, and complete polymerization or cross-linking curing within the battery, forming a continuous ion transport network, which combines the interface infiltration property of liquid electrolytes with the safety advantages of solid-state electrolytes. This report will focus on the design and regulation of in situ cured electrolytes for lithium metal batteries, highlighting the in situ polymerization and curing reaction mechanisms, electrolyte composition and structure design, electrode-electrolyte interface construction, lithium ion transport behavior, and strategies for improving battery safety performance. At the same time, by considering the actual requirements of high-specific-capacity lithium metal batteries, this report will analyze the key scientific issues and technical challenges faced by in situ cured electrolytes under conditions such as high-capacity cathodes, low electrolyte content, and thin lithium anodes, and explore their development prospects in advanced power batteries and large-scale energy storage.

Molecular Engineering of Orbital-Overlap-Driven Weakly Coordinating Solvation and Its Application in Low-Temperature Lithium Batteries

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ABSTRACT

Lithium batteries operating at low temperatures suffer from reduced ionic conductivity, sluggish Li^+ desolvation kinetics, increased interfacial resistance, and accelerated electrode/electrolyte side reactions, leading to rapid capacity decay and poor cycling stability. To overcome the limitations of conventional weakly solvating electrolytes that require large amounts of low-polarity or non-coordinating cosolvents, this study proposes a weakly coordinating electrolyte strategy based on enhanced orbital-overlap-induced dipole-dipole interactions.

A small amount of fluorinated silane cosolvent was introduced into strongly coordinating diethyl carbonate (DEC). The fluorine groups increase the positive character of silicon atoms, while weak orbital overlap between the vacant 3d orbitals of silicon and carbonate carbonyl oxygen enhances Si–O dipole coupling. This interaction decreases the electron density and negative electrostatic potential around carbonate carbonyl oxygen, weakening the coordination between Li^+ and carbonate solvents. Consequently, a weakly solvating structure is achieved with only a small amount of non-coordinating cosolvent.

The weakly coordinating solvation structure reduces the Li^+ desolvation energy barrier at low temperatures, promotes anion participation in the Li^+ solvation shell, and induces the formation of stable inorganic-rich electrode interphases. The developed electrolyte enables graphite||NCM811 batteries to deliver an initial capacity of 221.8 mAh g^{-1} at room temperature and maintain 88.8% capacity retention after 1000 cycles at 4.5 V cutoff voltage. A 4.7 Ah graphite||NCM811 pouch cell achieves an energy density of 219.7 Wh kg^{-1} at –20 °C and retains 69% of room-temperature capacity at –40 °C.

These results demonstrate that tuning Li^+ solvation structures through orbital-overlap-driven molecular interactions provides an effective strategy for developing high-energy-density lithium batteries with excellent low-temperature performance.

The In-Plane Thermoelectric Performance in SnSe Crystals

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ABSTRACT

Thermoelectric technology, as one of the solutions to energy harvesting, offers the direct and reversible conversion between electricity and heat. Emerging thermoelectric material SnSe shows great potential in both power generation and solid-state cooling. In contrast to the *p*-type SnSe, the high-performance *n*-type counterparts are difficult to put into application, restricted by the out-of-plane cleavable characteristic. In this work, we focus on the in-plane thermoelectric properties of *n*-type SnSe crystal to match with the *p*-type SnSe, which possesses high carrier mobility and high mechanical strength. We first alloyed Pb to reduce the deformation potential, raising the room-temperature carrier mobility to ~445 $cm^2\ V^{-1}\ s^{-1}$. Meanwhile, we used acoustic phonon scattering model to confirm that Pb incorporation did not alter the effective mass. The tuning of the deformation potential effectively decoupled carrier transport from phonon scattering, yielding a room-temperature *ZT* of ~0.4 and an average *ZT* of ~0.74 over 300–773 K. To achieve toxicity elimination, we subsequently replaced Pb with Te and Mo. We find that Te and Mo alloying continuously enhances the crystal symmetry, thereby increasing the carrier mobility to ~ 422 $cm^2\ V^{-1}\ s^{-1}$. Simultaneously, the conduction bands converge with the symmetry modification, further improving the electrical transport. Additionally, the lattice thermal conductivity is limited to ~ 1.1 $W\ m^{-1}\ K^{-1}$ due to the softness of both acoustic and optical branches. Consequently, we achieve a *ZT* of ~ 0.6 at 300 K and the average *ZT* of ~ 0.89 at 300-723 K. The single-leg device based on the obtained *n*-type SnSe shows a remarkable efficiency of ~ 5.3% under the ΔT of ~ 300 K, which is the highest reported in *n*-type SnSe. This work demonstrates the substantial potential of SnSe for practical applications of power generation and waste heat recovery.

Surface/interface charge regulation and energy harvesting devices

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ABSTRACT

Developing sustainable and distributed energy-harvesting technologies is essential for powering emerging electronic systems, including the Internet of Things and intelligent sensors. Triboelectric nanogenerators (TENGs) can convert low-frequency mechanical energy from the ambient environment into electricity, with their output performance strongly governed by the generation, transport, and dissipation of surface and interfacial charges. At high charge densities, coupled processes such as electrostatic breakdown, charge migration, and energy dissipation impose significant limitations on device performance and long-term stability. Meanwhile, complex electric double-layer dynamics at liquid–solid interfaces further constrain energy conversion efficiency. This presentation will focus on material surface and interfacial charge regulation, covering charge-density limit enhancement and stability control at gas–solid interfaces, directional surface charge transport and efficient charge collection, as well as liquid–solid interfacial charge dynamics and high-power-density energy harvesting. Strategies based on electrical property engineering, interfacial electric-field regulation, and device-structure optimization for improving the output performance and practical applicability of TENGs will also be discussed.

Design and performance regulation of multi-metal catalysts for oxygen evolution reaction

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ABSTRACT

Oxygen evolution reaction (OER) plays a crucial role in water electrolyzers and metal-air batteries. However, multi-step proton-coupled electron transfer induces to sluggish reaction kinetics and requires a high overpotential to harness the reaction. Therefore, it is highly desirable to develop valid and robust electrocatalysts to accelerate the reaction kinetics and lower the reaction energy barrier. Inspired by the aforementioned considerations, the electronic structure, coordination environment and interface of metal oxides/layered double hydroxides can be tailored *via* the different regulation strategies (vacancies engineering, surface reconstruction, amorphous/crystalline heterostructures and reducing the catalyst size, etc.), which is effectively optimizing the adsorption/desorption energy of the intermediate and showing the enhanced catalytic performance. Additionally, operando characterization and synchrotron X-ray absorption spectroscopy (XAS), coupled with density functional theory (DFT) calculations, provide valuable insights into the origins of catalytic enhancement and the underlying reaction mechanisms. For example, introducing oxygen vacancies into multilayered hollow $MnCo_2O_4$ microspheres narrows the bandgap and lowers the Co d-band center, thereby reducing the rate-determining free-energy barrier (OH* → O*). Ce single atoms were anchored at vanadium vacancies within the atomic layers of NiV LDH, enabling strong electronic coupling between the isolated atoms and the host lattice and consequently promoting water electrolysis kinetics. Collectively, these advances highlight the potential of coordinated electronic, structural and interfacial engineering for developing high-performance OER electrocatalysts.

Corrosion-inspired Zn anode materials for aqueous batteries

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ABSTRACT

Developing cost-effective and efficient renewable energy storage technologies represents a crucial pathway toward achieving the dual carbon goals. Aqueous zinc-ion batteries (AZIBs) exhibit significant application value and development potential in large-scale energy storage and smart grid systems due to their intrinsic safety and cost advantages. However, the thermodynamic instability of zinc metal anodes leads to spontaneous corrosion, further triggering issues such as dendrite growth. These phenomena constrain electrode reversibility and limit the batteries' power density and cycling lifespan. To address these challenges, we investigate the reaction mechanisms and failure modes of zinc anodes, and developed corrosion-inspired electrode materials to improve the electrochemical performance of aqueous batteries. By employing *in situ* optical imaging to capture critical information regarding crystal structure evolution and ion coordination changes at the electrode interface during corrosion, we elucidate the interfacial reaction mechanisms. Combined with *in situ* electrochemical analysis, we identify the failure mechanisms of electrode materials. These insights guide the design of highly reversible zinc anode materials capable of high-current cycling, ultimately contributing to the enhancement of power density and cycling stability in aqueous zinc metal batteries.

Photoelectrode Design for Photo-Assisted Lithium-Sulfur Batteries

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ABSTRACT

Lithium-sulfur batteries deliver an ultrahigh theoretical specific capacity of 1675 mAh g^{-1}, which renders them one of the most competitive candidates for next-generation large-scale energy storage systems. However, their practical deployment is severely plagued by two intrinsic drawbacks: the notorious shuttle effect of soluble lithium polysulfides and the sluggish multi-step sulfur redox kinetics. These issues mainly originate from the low electronic conductivity of elemental sulfur and solid sulfide discharge products. Photo-assisted lithium-sulfur batteries introduce photogenerated charge carriers to dynamically drive and catalyze bidirectional polysulfide conversion, offering a promising strategy to mitigate the above challenges simultaneously. Nevertheless, conventional photoelectrodes suffer from narrow visible-light response and fast recombination of photogenerated electron-hole pairs, which greatly limit photocatalytic activity and cell performance. This work systematically summarizes a series of modified photoelectrode materials developed for photo-assisted lithium-sulfur batteries, including Au@N-TiO_2 with Schottky junction, PPy@N-TiO_2 Z-scheme heterojunction, magneto-optical synergistic N-Co_9S_8@N-TiO_2, Co single-atom decorated N-TiO_2, and Zn-COF/MXene composite framework. Single-atom active sites, elaborately engineered heterogeneous interfaces and multi-external-field coupling strategies can effectively modulate electronic band structures, suppress carrier recombination, and reduce the reaction energy barrier of polysulfide redox transformation. The cage-like porous architecture of COF provides stable spatial confinement for soluble polysulfide intermediates, while MXene and conductive polymer PPy construct continuous high-speed electron transport networks. Multiple advanced characterization techniques including in-situ EIS, DRT analysis, together with DFT theoretical calculations, are adopted to deeply reveal the underlying photo-electro synergistic catalytic mechanism and sulfur conversion kinetics. The optimized photoelectrodes can remarkably improve the reversible discharge capacity, rate capability and long-term cycling stability of assembled photo-assisted lithium-sulfur batteries.

Porous Amorphous and High-Entropy Materials: Design and Applications in Energy Storage

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ABSTRACT

Dealloying and selective phase corrosion are well-established approaches for fabricating nanoporous materials. By employing amorphous alloys and high-entropy alloys as dealloying precursors, a diverse range of porous materials with unique structures and properties can be obtained. This report presents our group's recent work on these two types of unconventional precursors. With respect to amorphous materials, a flexible Ni-based amorphous alloy ribbon was chosen as the precursor, from which a flexible sandwich composite—featuring a nanoporous surface layer and an amorphous core—was constructed by etching. This architecture holds promise for applications in flexible wearable devices. In addition, selective phase etching was applied to a dual-phase amorphous alloy to produce a nanoporous amorphous alloy network. When used as a sulfur host for lithium-sulfur batteries, this porous network delivered favorable electrochemical performance, and both experimental and computational results confirmed its excellent stability. As for high-entropy materials, a porous high-entropy alloy network was developed as a sulfur host for lithium-sulfur batteries, demonstrating effective sulfur immobilization and catalytic activity. Moreover, through a high-entropy doping strategy, cathode materials for sodium-ion batteries and Li-rich Mn-based oxide cathodes were synthesized, both exhibiting favorable electrochemical performance. These studies highlight the considerable potential of porous amorphous and high-entropy materials in the field of energy storage.

Interface Design and Energy Storage Mechanism of Potassium-Ion Battery Anodes

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ABSTRACT

Potassium-ion batteries (PIBs), with their abundant resources and high energy density, are among the ideal candidates for large-scale energy storage. Sulfides based on alloy-conversion mechanisms offer high theoretical capacity and suitable working voltage, attracting increasing attention as anode materials for PIBs. However, due to slow kinetics and the loss of sulfur species during cycling, sulfide anodes suffer from rapid capacity fading and poor rate performance. Building upon our group's prior research on PIB anode materials, we propose a strategy involving the regulation of interface layer structure and composition to confine and catalyze sulfur species, thereby promoting fast and reversible conversion of sulfides. Taking Sb_2S_3 anode as an example, we designed a series of core-shell and hetero-interface structured Sb_2S_3 anode materials, investigated their potassium storage performance and structure-property relationships, providing theoretical guidance for the design of sulfide anodes in PIBs.

Design of Dual-Functional Photoactive Materials and Investigation of Photo-Charging Performance for Photo-Rechargeable Batteries

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ABSTRACT

Photo-rechargeable batteries can directly convert solar energy into chemical energy without the assistance of photovoltaic devices. They integrate the functional characteristics of solar energy conversion and energy storage devices, holding considerable practical significance for achieving a green and low-carbon energy transition. However, a thermodynamic trade-off exists between visible-light harvesting by narrow-bandgap materials and driving photoelectrochemical reactions over a broad range. Moreover, the complex energy conversion and multi-species transport processes result in sluggish kinetics, leading to a severe shortage of high-performance bifunctional photoelectrodes and restricting the rapid development of photo-rechargeable technology. To overcome these bottlenecks, we have successively designed multiple heterostructured materials integrating photoelectric conversion and electron-transfer interfaces, and applied them to photo-rechargeable sodium-ion batteries and photo-rechargeable zinc metal batteries. The resulting photo-rechargeable sodium-ion batteries and zinc metal batteries can be charged solely by light illumination and exhibit considerable specific discharge capacities and photoelectric conversion efficiencies, offering a highly promising research direction for the direct capture and storage of solar energy.

Intrinsic zero-strain anodes and their ion storage mechanism

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ABSTRACT

Silicon-based anodes (silicon and silica) for Li^+ batteries have advantages such as high capacity and low voltage. However, their large volume strain can cause rapid performance degradation and even pose safety hazards. Strategies such as encapsulation and composition adjustment can, to some extent buffer/reduce volumetric strain, but cannot fundamentally solve this problem. Intrinsic volume-zero-strain anodes such as lithium titanate have two structural features: ① they are constructed by strengthened chemical bonds and ② they contain large cavities for Li^+ storage. Although silica is composed of strong Si-O bonds, its intragranular cavities are small, and the insertion of Li^+ can cause Si-O bond breakage and Li-Si/Li-O bond reconstruction, resulting in significant volume strain. Therefore, this study proposes the creation of a new type of silica anode with large intragranular cavities using a strong Si-O bond (SiO_4) topology, achieving a transition in the Li^+ storage mechanism of silica (conversion/alloy type to solid solution type), thereby achieving intrinsic volume zero strain and excellent Li^+ storage performance. Firstly, the structural model is created and predicted using density functional theory (DFT). Then, the corresponding topological structure silica is constructed by referring to the preparation methods of common topological structure materials. The relevant theories and Li^+ storage characteristics and mechanisms of the intrinsic volume-zero-strain structure design of topological-structure silica are explored, and this method can be applied to the design of intrinsic zero-strain anodes of other components. This study can fundamentally solve the problem of high intrinsic volume strain in silicon-based anodes, and is expected to open up new fields, theories, and mechanisms for Li^+ storage in intrinsic low/zero strain anodes.

High Thermal Conductivity Aramid Insulating Paper/Film for Next-Generation Electric Drive Insulation Systems

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ABSTRACT

Variable-frequency motors are continuously evolving toward higher frequencies, voltages, and power densities, placing increasingly stringent demands on the thermal stability, corona resistance, dielectric reliability, and heat dissipation capability of electrical insulating paper. However, the intrinsically weak correlations and, in some cases, trade-offs among these properties make their simultaneous enhancement challenging within a single insulating material. Herein, we develop a high-performance aramid nanofiber (ANF)-based composite insulating paper for high-reliability insulation in next-generation electric vehicle drive systems. One-dimensional boron nitride nanotubes (BNNTs), two-dimensional boron nitride nanosheets (BNNSs), and nanoscale aluminum oxide (Al_2O_3) are employed as functional building blocks to construct a hierarchical multiscale architecture within the ANF matrix. Through spatial confinement and interfacial regulation, BNNTs are preferentially oriented along the fiber axis, establishing continuous phonon transport pathways while reinforcing the fibrous framework. Meanwhile, the synergistic interactions among ANFs, BNNTs, BNNSs, and Al_2O_3 generate abundant heterogeneous interfaces and interfacial energy barriers, which promote charge redistribution and introduce deep trap states, thereby suppressing charge injection, migration, and accumulation under high electric fields. Benefiting from the coordinated regulation of phonon and charge transport, the resulting composite paper simultaneously achieves enhanced thermal conductivity, breakdown strength, and corona resistance while retaining a low dielectric constant, low dielectric loss, and good mechanical flexibility. Furthermore, the thermal conduction and electrical insulation failure mechanisms are systematically elucidated by correlating the hierarchical structure, interfacial characteristics, and charge-transport behavior. This work provides a structural strategy and mechanistic understanding for developing multifunctional insulating paper with enhanced thermal management and electrical reliability, offering materials and theoretical foundations for high-reliability, long-life insulation components in next-generation electric vehicle drive systems.

Studies on Catalytic Conversion of Energy Small Molecules Based on Polyoxometalates and Framework Materials

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ABSTRACT

Aiming at the storage and catalytic conversion of energy small molecules, this work takes polyoxometalates (POMs) and framework functional materials as research objects, and systematically investigates structural modulation, electronic state optimization and device applications of materials. A host-guest confinement composite strategy is adopted to address the inherent drawbacks of POM clusters, such as severe aggregation and poor stability. Aqueous energy-storage electrode materials are fabricated to comprehensively boost electrochemical performance. By compositing POMs with framework carbon materials, diverse interface engineering strategies are applied to tune electronic structures, accelerate electrocatalytic reaction kinetics, and improve catalytic activity and operational stability for water electrolysis systems. Meanwhile, rational design of framework catalysts is implemented. Coordination engineering, heteroatom doping and conjugated structure regulation are utilized to construct high-efficiency active sites, and a series of catalytic systems are developed, including low-noble-metal acidic oxygen evolution, bifunctional electrocatalysts for Zn-air batteries, and near-infrared driven CO_2 photoreduction. From material design, mechanistic analysis to device performance evaluation, this study establishes a research paradigm of POM-framework materials for energy small-molecule conversion, providing theoretical references and technical routes for the development of high-performance energy catalytic and energy-storage materials

Preparation of Micro-and Mesoscopic Carbon-Based Materials and Their Energy Electrochemical Performance

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ABSTRACT

To mitigate environmental pollution and the energy crisis, high-performance electrochemical energy storage and conversion devices are urgently needed. Developing well-matched high-performance electrode materials or electrocatalysts is of critical importance. As the core components of electrochemical energy storage and conversion devices, these materials exert a decisive impact on device performance. This report summarizes and prospects the fundamental and applied research conducted by our group on synthetic methodologies, precise fabrication, energy storage and device engineering of carbon-based materials with micro-mesoscale assembled structures oriented toward energy storage. Using novel structure-directing fabrication strategies, we have designed and synthesized a series of carbon-based micro-mesoscale assembled architectures. Precise regulation of their micro-mesostructures optimizes and boosts their performance in zinc–air batteries, rechargeable metal batteries, water electrolysis for hydrogen production, etc. It is anticipated that these findings will advance the development of next-generation energy storage and conversion systems.

Defect-Engineered $NiCo_2S_4$-x Nanosheets on Hollow Carbon Spheres as a Bifunctional Separator Coating for Long-Life Lithium–Sulfur Batteries

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ABSTRACT

Lithium–sulfur (Li–S) batteries are promising candidates for next-generation energy storage, yet their practical application is severely hindered by the lithium polysulfide (LiPS) shuttle effect and sluggish redox conversion kinetics. Herein, we construct a defect-engineered functional separator coating composed of sulfur-vacancy-rich $NiCo_2S_4$-x nanosheets vertically grown on hollow carbon spheres ($NiCo_2S_4$-x@HCS). The 3D conductive hollow carbon sphere framework provides interconnected electron/ion transport pathways and effective physical confinement for LiPSs, while the strategically introduced sulfur vacancies reconstruct the local electronic structure, thereby lowering the energy barriers for bidirectional LiPS redox conversion and Li_2S nucleation/dissolution. Benefiting from this physical–chemical synergistic barrier, the $NiCo_2S_4$-x @HCS/PP separator endows Li–S batteries with exceptional electrochemical stability, delivering a high reversible capacity of 641.6 mAh g-1 after 1000 cycles at 2.0 C with an ultralow capacity decay rate of 0.0496% per cycle. Furthermore, even under a high sulfur loading of 4.66 mg cm^{-2}, a remarkable areal capacity of 4.08 mAh cm^{-2} is achieved after 50 cycles at 0.1 C. This work demonstrates the potential of defect engineering in transition metal sulfides for accelerating polysulfide catalysis and offers a promising design strategy for high-energy-density Li–S batteries.

Natural Small-Molecule Ethyl Maltol as a Multifunctional Electrolyte Additive for Stable Zinc Anodes in Aqueous Zinc-Ion Batteries

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ABSTRACT

Aqueous zinc-ion batteries (AZIBs) hold broad prospects for large-scale energy storage owing to their high safety, low cost, and environmental friendliness. Nevertheless, zinc anodes suffer from dendrite growth, hydrogen evolution, and by-product accumulation, which severely limit cycling lifespan and Coulombic efficiency. To address these challenges, this work adopts natural small-molecule ethyl maltol as a multifunctional electrolyte additive and systematically investigates its regulation on the Zn^{2+} solvation structure and zinc anode interfacial stability.

Experimental results reveal that hydroxyl and carbonyl groups in ethyl maltol partially replace coordinated water in the Zn^{2+} solvation sheath, disrupt the water hydrogen-bond network, and reduce active water content, thereby suppressing hydrogen evolution and basic zinc sulfate by-product formation. Meanwhile, ethyl maltol preferentially adsorbs on the zinc surface and in situ forms a hydrophobic organic protective layer, isolating water and sulfate from the substrate and restraining corrosion and side reactions. It also improves electrolyte wettability, facilitating uniform and dense Zn^{2+} deposition.

Benefiting from this triple synergistic regulation, Zn||Zn symmetric cells with 4 mmol L^{-1} ethyl maltol cycle stably over 1780 h at 1 mA cm^{-2}/1 mAh cm^{-2} and exceed 560 h at 5 mA cm^{-2}/5 mAh cm^{-2}. Zn||Cu half-cells maintain >99.9% Coulombic efficiency over 400 cycles. Zn||V_2O_5 full cells retain 53.3% capacity after 880 cycles at 10 A g^{-1}, versus 30% for the pristine electrolyte. Ethyl maltol also lowers the electrolyte crystallization temperature from -18.7℃ to -22.4 °C, broadening the low-temperature application window. This study provides an effective, low-cost strategy to resolve zinc anode issues and advance AZIB practical applications.

Forum 3: Optoelectronic Functional Materials and Integrated Photonics

Halide perovskite integrated photonics

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ABSTRACT

Halide perovskites have emerged as a remarkably versatile material platform for next-generation semiconductor optoelectronics, with exceptional performance demonstrated across solar cells, light-emitting diodes, photodetectors, and lasers. Beyond these established applications, the distinctive chemical and electronic properties of halide perovskites (such as high absorption coefficients, defect-tolerant band structures, and tunable bandgaps) have driven intensive investigation into their nonlinear optical behavior, which offers substantial potential for integrated photonic circuits. Recent advances using halide perovskite nanostructures with optical resonances spanning the visible and near-infrared ranges have uncovered efficient multiphoton-induced photoluminescence, coherent harmonic generation, and ultrafast all-optical modulation, allowing dynamic light control at sub-wavelength scales. For integrated photonics, a critical requirement is that light be guided and confined on-chip. Nonlinear propagation studies in perovskite planar waveguides have shown low-loss guiding and phase-matched frequency conversion, which are essential for parametric processes and signal processing. In addition, efficient coupling of emission from perovskite microlasers, including whispering-gallery-mode and Fabry–Pérot cavities, into diverse passive waveguiding systems, such as metal-oxides, silicon, gallium phosphide, and polymer waveguides, has been achieved, demonstrating that perovskites can serve as active on-chip light sources.

These demonstrations tackle a central challenge in integrated photonics: combining high-gain, nonlinear emitters with low-loss passive routing components. The low-temperature solution processability of perovskites further enables compatibility with hybrid integration schemes and flexible substrates, avoiding the epitaxial constraints associated with conventional III-V

semiconductors. Nonetheless, obstacles persist, including long-term stability, lithographic patterning fidelity, and mitigation of ion migration under electrical pumping. Still, the combination of strong nonlinearities, tunable resonances, and demonstrated waveguide coupling establishes halide perovskites as a compelling material system for future integrated photonic platforms, with applications spanning compact frequency combs and entangled photon sources to neuromorphic photonic circuits and on-chip optical interconnects.

Towards the Realization of Photonic Time Crystals

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ABSTRACT

Photonic time crystals (PhTCs), formed by materials whose electromagnetic properties vary periodically in time, provide a new route for controlling light through momentum bandgaps and parametric amplification. However, conventional non-resonant PhTCs generally require strong and ultrafast modulation to open appreciable momentum bandgaps, which poses a major challenge for experimental implementation, especially at high frequencies. In this talk, I will discuss a resonance-based strategy for overcoming this limitation. Starting from Lorentz-type dispersive media, we establish a simple and general rule for estimating the momentum-bandgap size of a time-varying material from the dispersion relations of two corresponding stationary materials. This framework reveals a fundamental difference between modulating the plasma frequency and modulating the resonance frequency: while plasma-frequency modulation produces a finite bandgap, resonance-frequency modulation can, in the ideal limit, lead to an infinitely wide momentum bandgap. We further examine the influence of material loss, showing that dissipation mainly affects the amplification rate rather than the momentum-bandgap width. Building on these insights, we extend the concept from bulk Lorentz media to time-varying resonant metasurfaces. By modulating the resonance frequency of highly resonant meta-atoms, the momentum bandgap can be dramatically enlarged and can cover both free-space and surface-wave regions of momentum space. The role of the resonance quality factor is also discussed, illustrating how stronger resonances can further enhance the accessible momentum range and amplification. Finally, we discuss possible optical metasurface implementations based on resonant dielectric structures, connecting the theoretical picture with realistic photonic platforms. These results highlight resonant time modulation as a promising route toward experimentally realizable photonic time crystals with enhanced bandgaps and wave amplification.

Coherent thermal emission generation enabled by nonlocal metasurfaces

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ABSTRACT

Traditional thermal radiation originates from the spontaneous emission of a vast number of thermally excited electric dipoles with distinct frequencies, orientations, and moments within a bulk material; thus, it inherently exhibits broadband, omnidirectional, and unpolarized characteristics. By coupling this incoherent spontaneous emission into nonlocal metasurfaces and launching it into free space, coherent infrared signals can be efficiently generated. In this talk, I will review our latest research progress on key physical mechanisms in nonlocal metasurfaces, including high-Q resonances, photonic flatbands, and chiral responses[1]. Leveraging these mechanisms, I will demonstrate schemes for achieving infrared radiation with high temporal and spatial coherence, highlighting the feasibility of utilizing an infrared lens to collect large-area infrared signals while maintaining their temporal coherence[2]. Additionally, I will introduce control methodologies for coherent thermal emission ranging from circular polarization[3] to full polarization states[4], and even structured light fields[5]. Finally, I will present the dynamic spectral tuning and chirality reversal of circularly polarized thermal emission[6]. By dynamically compensating for structural fabrication errors, this approach achieves a precise match between the thermal emission wavelength and the fingerprint absorption of chiral matter, thereby offering a novel technological pathway for the efficient identification of chiral substances.

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Picosecond low-threshold all-optical switching enabled by giant broadband optical nonlinearity

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ABSTRACT

Ultrafast all-optical switching (AOS) is pivotal for advancing integrated photonic devices, from high-speed photonic information processing to next generation all-optical computing and communication networks. However, conventional nonlinear materials suffer from slow response time, high power threshold, weak and narrow-bandwidth optical nonlinearities, critically limiting their viability. Here, we report a heteroatom engineering strategy to overcome these limitations by designing zero-dimensional nitrogen-doped carbon quantum dots (N-CQDs) with nonlinear optical performance far exceeding the state-of-the-art. Leveraging spatial self-phase modulation (SSPM) and ultrafast pump-probe technique, we first demonstrate an all-in-one AOS platform, where femtosecond laser pulses serve dual roles as control and signal beams. The AOS simultaneously realizes ultrafast response time (3.2 ps), ultralow threshold energy (2.2 W $cm^{-2)}$, and giant nonlinear refractive indices (10−5 cm^2 W^{-1}) across an exceptionally broad spectral range (400 nm-1064 nm), outperforming state-of-the-art nonlinear carbon materials (i.e. carbon nanotube) by orders of magnitude. Spectroscopic and band-structure analyses attribute these exotic performances to enhanced n-π* interaction enabled by N doping, which amplifies nonlinear polarization dynamics. Crucially, ultrafast fluorescence spectroscopy reveals a large two-photon absorption cross-section of the N-CQDs, challenging the conventional cognition that broadband SSPM necessitates single-photon excitation.

Nanoparticle Superlattices as Functional Materials for Programmable Nanophotonics

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ABSTRACT

Nanoparticle superlattices, or supercrystals, provide a unique platform for constructing functional photonic materials by integrating nanoscale building blocks into highly ordered architectures. Unlike conventional lithographically fabricated metasurfaces, superlattices offer intrinsic control over interactions at multiple length scales, while their modular composition enables the incorporation of diverse metallic, dielectric, and semiconductor nanoparticles. Here, we explore nanoparticle superlattices as functional materials for advanced nanophotonics, with a particular focus on plasmonic supercrystals. Using self-assembled plasmonic superlattices as templates, we develop a low-cost and wafer-scale fabrication strategy for high-quality optical structures. By suppressing the effective-medium extinction coefficient and engineering collective radiative coupling, low-radiation-loss bound states in the continuum (BICs) and guided-mode resonances can be supported by the nanoparticle assemblies. As a result, plasmonic resonances with quality factors approaching 8000 are experimentally achieved, demonstrating that collective optical modes in self-assembled superlattices can overcome the intrinsic loss limitations commonly associated with plasmonic materials. We further introduce a simplified electron-beam patterning approach that directly functionalizes the self-assembled superlattice without relying on conventional resist processing. This strategy enables programmable pattern definition while preserving the molecular-scale interparticle gaps of the superlattice, providing a route toward electron-writable photonic devices with simultaneously programmable mesoscale geometry and nanoscale optical confinement. Finally, we demonstrate the excitation of a plasmonic anapole state in supercrystal disk structures. The resulting mode combines strong energy confinement, a small effective mode volume, and substantial field localization within the interior of the nanoparticle assembly rather than being restricted to conventional metal surfaces or edges. These results establish nanoparticle superlattices as a versatile class of functional photonic materials and provide new opportunities for scalable, programmable, and strongly confined nanophotonic devices.

SparseFocus: Learning-based One-shot Autofocus for Microscopy with Sparse Content

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ABSTRACT

Rapid and reliable autofocus is a prerequisite for high-throughput microscopic imaging across life sciences, pathology, and industrial inspection, yet it remains a bottleneck in whole slide imaging (WSI) and other large-field scanning applications. Conventional solutions rely on dedicated hardware or iterative hill-climbing searches, limiting speed and stability. Recent learning-based approaches enable one-shot autofocus that predicts the defocus distance from a single image. However, autofocus performance depends strongly on image richness: for sparse content, as in transparent or weakly stained slides, existing methods tend to fail. We propose SparseFocus, a two-stage one-shot autofocus pipeline that first measures the importance of image regions and then estimates the defocus distance from the informative regions, enabling reliable autofocus across dense, sparse, and extremely sparse content. Experiments on millions of in-house labeled defocused images show that SparseFocus surpasses existing methods at all sparsity levels. We then address the short working distance of high-NA objectives with a remote-focus scheme, which decouples focus adjustment from the objective and performs it through an optically conjugated remote plane with sub-micrometer accuracy, leaving the specimen space unobstructed — valuable for light-sheet microscopy and volumetric imaging. To cover centimeter-scale specimens, we develop a real-time stitching algorithm combining four-neighborhood matching with cumulative-error elimination, assembling thousands of tiles into drift-free gigapixel panoramas. These techniques are integrated into WSI systems achieving gigapixel imaging of centimeter-sized specimens within tens of seconds, applied in digital pathology, semiconductor inspection, and biomedical detection. Building on this, we extend the instrumentation toward automated optical inspection (AOI) of photonic chips for AI computing, combining computational spectral imaging, one-shot autofocus, and AI-based defect recognition on a single platform for wafer-level inspection of 800G/1.6T optical chips; a principle prototype is operational. Together, these systems bring gigapixel, always-in-focus imaging from pathology slides to photonic wafers, turning rapid focus from bottleneck into routine capability.

Quantum-classical analogies in Floquet optical systems

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ABSTRACT

Spatial Floquet engineering or longitudinal periodic driving provides a new engineering dimension for optical system design, demonstrating remarkable capabilities in optical field manipulation, which encompasses rich optical effects and physical mechanisms. Based on the analogies between the wave propagation and particle dynamics equations, quantum-like phenomena in Floquet photonic lattices are studied. In dynamically modulated waveguide arrays with an external spatial linear potential, novel dynamical phenomena with no analogue in ordinary discrete waveguides, named rectified Bloch oscillations, are highlighted. In addition, in a periodically driven trimer lattice with chiral symmetry, an optical wave dynamics simulation scheme for Zitterbewegung based on the relativistic Dirac equation is proposed. The central zero band can inhibit the diffusion of positive and negative energies, affect the duration of band interference through localization, and prolong the lifetime of Zitterbewegung effect. Furthermore, a different type of phase modulated Floquet topological insulators based on Lieb lattices was also proposed, which is characterized by the anomalous edge states from the flat-band localization and topological Chern-type edge states. Three types of truncated boundaries, called two-point boundaries, three-point boundaries, and composite boundaries are considered, both the Chern-type and anomalous edge states in different bandgaps are also highlighted, their rich topological characteristics, such as unidirectional propagation, anti-scattering, and immunity to defects, are demonstrated. The research results would significantly enrich optical manipulation methodologies and establish theoretical foundations for designing novel integrated photonic devices.

Forum 4: Interdisciplinary Forum

Thermal Management Materials and Heterogeneous Integration Technologies for High-Performance GaN Semiconductor Chips

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ABSTRACT

Wide-bandgap semiconductors (e.g., GaN) are promising materials for high-performance chips, yet severe self-heating under high-power operation significantly limits device reliability and lifetime.[1-2] While diamond offers superior thermal conductivity, its high cost remains a constraint. This can be achieved by integrating much cheaper and cost-effective high thermal conductivity polycrystalline diamond (PCD) in different areas of a GaN HEMT, i.e., replacing the substrate, or growing on top of the HEMT channel, through wafer bonding or direct growth. This paper systematically investigates the TBR and thermal conductivity of PCD grown on top of GaN HEMT and used as a substrate replacement using characterization methods such as transient time-domain thermoreflectance. Also, we design and compare the effects of different high thermal conductivity buffer layer materials and diamond growth parameters on TBR and thermal conductivity. Based on the obtained experimental parameters, we then employ FEM methods to design and optimize the thermal management of GaN/PCD hetero-structures in multi-finger HEMT devices. This provides essential guidance for material growth and device integration to improve heat dissipation ability of GaN/PCD devices.[1-3] Integrating GaN with low-cost Si substrates, however, faces challenges due to lattice and thermal expansion coefficient mismatch. Using surface-activated bonding (SAB), we achieved direct GaN/Si bonding at room temperature without buffer layers, resulting in significantly reduced interfacial stress. Through appropriate thermal treatment, the interfacial structure, thermal boundary resistance, and stress can be effectively regulated, offering a viable route toward high-quality, low-stress GaN/Si integration compatible with CMOS technology.[4-7] Furthermore, to address thermal management issues in SOI devices, multiple direct bonding techniques were investigated. It was demonstrated that SAB combined with annealing simultaneously achieves low thermal resistance and low stress at the Si/SiC interface, laying a foundation for advanced thermal management in high-power device applications.[6-14]

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Machine-learning-guided photonic-thermal co-design for passive thermal batteries

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ABSTRACT

Passive thermal batteries provide a route for harvesting intermittent optical energy, storing it as heat, and generating electricity both during and after illumination without active energymanagement components. Central to their performance is the photonic interface, where spectrally selective absorption governs the conversion of incident radiation into heat while suppression of unwanted thermal emission helps retain the captured energy. The resulting device performance therefore depends on strongly coupled photonic, thermal, material, geometric, and thermoelectric parameters, making conventional sequential optimization inefficient. Here, we develop a physicsbased machine-learning framework for the photonic–thermal co-design of a passive thermal battery integrating a selective absorber, thermal-storage medium, thermoelectric generator, and thermal insulation. A transient physical model generates time-resolved electrical responses under light-on and light-off conditions, from which a neural-network surrogate learns the relationship between device and material parameters and overall energy-conversion performance. The framework enables rapid inverse design and reveals trade-offs among optical energy capture, device geometry, storage density and heat capacity, thermoelectric properties, output power, and post-illumination operating time. Experiments on a prototype device under varied illumination intensities, insulation configurations, and storage materials reproduce the principal trends predicted by the model. This integrated photonic, thermal, and data-driven approach provides a scalable framework for passive optical-energy harvesting, thermal storage, and electricity generation across applications ranging from distributed sensors to building and solar-thermal energy systems.

Theoretical Redshift Signatures of Horizonless Compact Objects for Astrophotonic Spectroscopy

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ABSTRACT

Horizonless compact objects provide a useful theoretical framework for exploring strong-field gravity and possible alternatives to black holes. In this work, we study the spectroscopic consequences of the analytic Imran-class compact-object model and develop a source-informed astrophotonic framework that connects relativistic predictions with measurable optical signatures. The theoretical model describes a regular, static, spherically symmetric interior that is smoothly matched to an exterior Schwarzschild spacetime. Its matter variables, mass function, compactness, stability conditions, and surface gravitational redshift are obtained analytically, allowing the observable consequences of changes in the internal geometry to be studied without introducing a thin shell. Our main focus is the relationship between compactness and gravitational redshift. The model shows that as compactness increases, the surface redshift rises systematically, shifting emitted spectral features toward longer wavelengths. This gives a direct theoretical link between the internal structure of a compact object and an observable spectroscopic quantity. We use representative optical lines as reference markers to translate the predicted redshift into specific target wavelengths, and we examine the spectrometer resolving power, wavelength accuracy, signal-to-noise ratio, and line recovery needed to distinguish between different compactness regimes. Altogether, this connects analytic strong-gravity theory with astrophotonic spectroscopy in a way that is grounded directly in the source physics. Experimental validation is currently underway. The planned laboratory measurements will reproduce the model's predicted wavelength shifts using controlled optical sources, testing how accurately the spectrometer can recover the target wavelengths and corresponding redshifts under realistic calibration and noise conditions. These experimental results will then be compared directly against the theoretical predictions. Overall, this work offers a practical bridge between horizonless compact-object theory and future astrophotonic tests of strong-gravity signatures.

Metasurface-based multichannel Neural Network

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ABSTRACT

Exciton condensation at room temperature opens a promising way for new low-threshold coherent light sources for ultra-fast information processing. To develop a stable emitter with pre-defined nonlinear properties, a CdSe/CdZnS nanoplatelets metasurface with adjusted resonant mode field distribution has been implemented. The designed metasurface provides enhanced photonic nonlinear functions, including efficient resonant mode tuning and multichannel coherent emission, which are essential for nonlinear optical data processing. Precisely tuned coherent multichannel output enables general-purpose full-connected and convolutional neural networks (NN) for shape recognition tasks. In the convolutional architecture, a first shared layer extracts low-level visual features, which are then mapped into the effective pump-fluence range of the active metasurface. The resulting feature maps are simultaneously routed through six resonant nonlinear activation functions, forming six parallel branches, each corresponding to an independent optical channel in energy-momentum space. Each branch performs independent nonlinear transformation, pooling, convolutional processing, fully connected embedding, and finally produces its own classification output. The six predictions are aggregated via weighted voting ensemble, thereby integrating complementary information across branches. This six-branch parallel design enriches the nonlinear response of the photonic neural network and significantly improves its capability for complex feature extraction and classification. Revealed energy and angular parallelism, together with clear isolation in parametric space, leads to a neural branches ensemble enabling 98.96% recognition accuracy for MNIST and 63.35% for CIFAR-10. Ultrafast response and low energy consumption per node pave the way for the practical implementation of controllable coherent sources for optical and hybrid neural networks.

Plasmonic Band-Edge Laser Loss Engineering and Mode Identification

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ABSTRACT

Multiple band-edge states within the gain bandwidth of a plasmonic lattice often exhibit comparable losses, leading to mode competition and making stable single-mode lasing difficult to achieve. This report focuses on loss engineering and mode identification in band-edge plasmonic lasers based on a binary aluminum nanopillar lattice. A compound basis consisting of circular and cross-shaped nanopillars, combined with a pillar-height offset and an optimized filling factor, redistributes the radiative and nonradiative losses and creates a pronounced loss contrast between the Γ-point A2 state and the competing modes. Subsequent anodization of the aluminum substrate further reduces the decay rate of the target mode and tunes the band edge into the gain region of Nile Red. Under 515 nm femtosecond-pulse excitation, the optimized structure achieves room-temperature single-mode lasing at 648 nm, with a threshold fluence of 6.3 μJ cm^{-2} $pulse^{-1}$, a linewidth of approximately 0.65 nm, and stable emission for more than 20 min. Pump-dependent spectroscopy, momentum-space imaging, self-interference measurements, and the polarization distributions of the first-order Fourier components consistently identify the lasing state as the Γ-point A2 band-edge mode. These results demonstrate that simultaneously achieving low absolute loss, sufficient loss contrast between competing modes, and finite radiative outcoupling is essential for stable single-mode lasing in plasmonic lattices.

Symmetry-engineered Ag nanoarrays for surface lattice resonance lasing

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ABSTRACT

Plasmonic nanostructures concentrate and manipulate light beyond the diffraction limit, thus providing versatile applications in nanoscale photonics, sensing, and optoelectronics. Plasmonic nanolasers achieve subwavelength-scale light field localization and coherent emission through plasmonic structures, and yet their practical applications are constrained by complex fabrication processes and limited reproducibility of device performance. A central challenge in this field is therefore to reduce lasing thresholds together with scalable fabrication, because radiative loss, diffraction-mediated leakage, and structural disorder can strongly deteriorate the cavity quality factor and the net gain. Here we demonstrate large-area plasmonic lattice lasing enabled by unit-cell symmetry engineering of surface lattice resonances (SLRs) in periodic Ag nanoarrays. Over a large area of 1 cm^2 binary and ternary unit cell arrays are fabricated by a binary-pore anodic aluminum oxide (AAO) template, enabling low-cost and controllable production over large areas. Angle-resolved reflectance measurements further reveal that the ternary array yields a sharper SLR mode overlapping the Nile Red emission band (~646 nm). Under optical pumping at 515 nm with femtosecond pulses, the ternary array exhibits a lower lasing threshold (2.23×10^4 μJ·cm^{-2}·$pulse^{-1}$) than the binary array (2.62×10^4 μJ·cm^{-2}·$pulse^{-1}$). Moreover, the alumina substrate improves thermal management, thereby extending the stable lasing temperature window. These results demonstrate low-threshold laser emission from a scalable fabricated device in a plasmonic laser system, establishing a scalable AAO template and diffraction-channel engineering approach for plasmonic lattice lasing, and providing a practical platform for coherent light sources in integrated nanophotonics and elevating SLR laser technology to a new level.

Polyaniline-Regulated Hollow Ceramic Microsphere-Based Core-Shell Composites for Lightweight Broadband Microwave Absorption

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ABSTRACT

Lightweight microwave absorbers with strong attenuation, broad effective absorption bandwidth, and small matching thickness are highly desirable for electromagnetic protection, yet simultaneously balancing dielectric loss and impedance matching remains challenging. In this work, hollow ceramic microspheres (HCMs) were employed as lightweight structural frameworks, and polyaniline (PANI) was introduced as a tunable dielectric regulation phase to construct two representative core-shell absorbing systems: HCM@PANI and hierarchical HCM@NZF@PANI, in which Ni-Zn ferrite (NZF) provides additional magnetic response and heterogeneous interfaces. The HCM@PANI composites were prepared by surface functionalization followed by in-situ oxidative polymerization, and the optimized HCM@PANI-50 exhibited a minimum reflection loss of -47.17 dB at 13.84 GHz with a thickness of 2.1 mm and an effective absorption bandwidth of 5.36 GHz at 2.0 mm. Further introduction of NZF generated a multiphase magnetic/dielectric architecture, while the outer PANI layer continuously regulated complex permittivity, conductive pathways, and interfacial polarization. The optimized HNP-60 achieved a minimum reflection loss of -47.55 dB at 16.24 GHz with a thickness of only 1.5 mm and a broad effective absorption bandwidth of 5.52 GHz at 1.7 mm, covering 11.76-17.28 GHz. Electromagnetic analyses demonstrate that the enhanced absorption originates from the synergistic effects of conductive loss, dipole polarization, Maxwell-Wagner interfacial polarization, hollow-structure-induced multiple scattering, optimized impedance matching, and auxiliary magnetic response from NZF. Radar cross-section simulations further confirm substantial far-field backscattering suppression. These results demonstrate that hierarchical interfacial engineering and PANI-mediated dielectric regulation provide an effective strategy for developing lightweight, thin, broadband, and high-efficiency microwave absorbing materials. The progressive design also clarifies structure-property relationships across binary and ternary systems.

Abstracts of Contributed Posters

Forum 1: Nano-Functional Materials

VO_2-Integrated Multifunctional Dielectric Metasurface for Dual-Channel Topological Beam Generation

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ABSTRACT

Opological optical beams, such as optical skyrmions and bimerons, have attracted considerable interest owing to their nontrivial topological textures and potential applications in high-capacity optical communication, information encoding, and topological photonics. However, most reported approaches are restricted to a single output channel and lack dynamic reconfigurability, which constrains their functionality and integration density. Here, we design a VO_2-integrated multifunctional dielectric metasurface that generates dual-channel topological beams in a single device. By independently controlling two orthogonal polarization components, the metasurface produces optical bimerons with tailored topological textures. Integrating VO_2 enables a thermally induced phase transition, allowing dynamic switching between transmission and reflection modes. The bimerons generated in these two modes have different skyrmion numbers, providing an additional degree of freedom for manipulating the topological state. Furthermore, by varying the polarization angle of the incident light, the topological output can be continuously tuned from a zero-order Bessel beam to a first-order bimeron, and finally to a first-order Bessel beam, with intermediate states in between. This work offers a compact and reconfigurable platform for generating and manipulating topological optical fields, and may find applications in multifunctional nanophotonic devices, optical trapping, and high-dimensional optical information processing.

Forum 2: Advanced Energy and Environmental Materials

PET-derived lead precursor for the preparation of high luminescent perovskite-polymer composites

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ABSTRACT

The valorization of waste polyethylene terephthalate (PET) as a source of functional ligands offers a sustainable approach to the development of advanced luminescent materials. In this work, PET was chemically transformed to obtain terephthalate-based lead metal–organic framework (Pb-MOF), which were investigated as precursors for the formation of lead halide perovskites. Particular attention was given to the thermal conversion of the Pb-MOF-based precursor system. The evolution of the material during thermal treatment was studied using powder X-ray diffraction (PXRD), revealing changes in the crystalline phase and an increase in luminescence intensity upon conversion.

To demonstrate the practical applicability of the developed precursor approach, the Pb-MOF-derived system was incorporated into a polymethyl methacrylate (PMMA) matrix using hot pressing. The resulting polymer composites exhibited visible photoluminescence, demonstrating the feasibility of combining MOF-derived precursors with polymer processing technologies. A comparison with composites prepared using conventional lead bromide precursors indicated enhanced luminescence for the Pb-MOF-based system, highlighting the potential role of the MOF-derived chemical environment in the formation and optical properties of the luminescent phase.

The presented results demonstrate a pathway from chemical recycling of PET to functional luminescent polymer composites and establish Pb-MOFs as potential precursors for scalable processing approaches, including extrusion and continuous polymer manufacturing. This strategy may provide a basis for the development of luminescent and smart polymer materials using recycled feedstocks and adaptable processing technologies.

Forum 3: Optoelectronic Functional Materials and Integrated Photonics

Metasurface-based multichannel Neural Network

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ABSTRACT

Exciton condensation at room temperature opens a promising way for new low-threshold coherent light sources for ultra-fast information processing. To develop a stable emitter with pre-defined nonlinear properties, a CdSe/CdZnS nanoplatelets metasurface with adjusted resonant mode field distribution has been implemented. The designed metasurface provides enhanced photonic nonlinear functions, including efficient resonant mode tuning and multichannel coherent emission, which are essential for nonlinear optical data processing. Precisely tuned coherent multichannel output enables general-purpose full-connected and convolutional neural networks (NN) for shape recognition tasks. In the convolutional architecture, a first shared layer extracts low-level visual features, which are then mapped into the effective pump-fluence range of the active metasurface. The resulting feature maps are simultaneously routed through six resonant nonlinear activation functions, forming six parallel branches, each corresponding to an independent optical channel in energy-momentum space. Each branch performs independent nonlinear transformation, pooling, convolutional processing, fully connected embedding, and finally produces its own classification output. The six predictions are aggregated via weighted voting ensemble, thereby integrating complementary information across branches. This six-branch parallel design enriches the nonlinear response of the photonic neural network and significantly improves its capability for complex feature extraction and classification. Revealed energy and angular parallelism, together with clear isolation in parametric space, leads to a neural branches ensemble enabling 98.96% recognition accuracy for MNIST and 63.35% for CIFAR-10. Ultrafast response and low energy consumption per node pave the way for the practical implementation of controllable coherent sources for optical and hybrid neural networks.

Programming the topological charge and divergence of femtosecond-printed perovskite gear-shaped microlasers

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ABSTRACT

Orbital angular momentum (OAM) offers an unbounded set of orthogonal optical channels for communication, chiral sensing and imaging, yet compact chip-scale sources of coherent vortex beams remain difficult to realise. Whispering-gallery-mode (WGM) microdisks are natural candidates, but a rotationally symmetric disk has no phase-matched radiation channel along its axis: its guided mode lies above the light line, so the escaping light leaves at grazing angles and carries no designed wavefront. Here we report vortex-beam lasing from gear-shaped $MAPbBr_3$ microdisk resonators produced by single-step femtosecond-laser nanopatterning. A spatial light modulator converts the 513 nm, 220 fs writing beam into an annular set of q/4 diffraction-limited spots; rotating it four times imprints a closed chain of q nano-craters into a 150 nm perovskite film. The micro-ring's azimuthally modulated sidewall acts at once as a high-quality cavity and as an angular grating: it subtracts q/R from the azimuthal momentum of a WGM with number p, so the out-coupled beam leaves along the normal with a Pancharatnam charge $\ell = p - q$ fixed purely by geometry. Semi-analytical mode analysis of the curved waveguide (effective index 1.81–1.88 for radii 2.9–7.5 μm) sets the angular period near 300 nm within ±2 nm. The printed cavities lase at 549.5 nm with thresholds of 50–70 μJ/cm², only slightly above smooth microdisks of equal radius, with Q above 10^3. Back-focal-plane imaging with polarisation and spectral filtering reveals annular far fields and radial polarisation consistent with vector-vortex emission, reproduced by full-wave simulations. At fixed q = 120, varying the radius from 5.79 to 5.56 μm tunes the topological charge from −3 to +2 at one wavelength, while the divergence scales with cavity size. Laser printing thus provides a single-step route to structured-light perovskite microlasers with reconfigurable topological charge.

Plasmonic Band-Edge Laser Loss Engineering and Mode Identification

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ABSTRACT

Multiple band-edge states within the gain bandwidth of a plasmonic lattice often exhibit comparable losses, leading to mode competition and making stable single-mode lasing difficult to achieve. This report focuses on loss engineering and mode identification in band-edge plasmonic lasers based on a binary aluminum nanopillar lattice. A compound basis consisting of circular and cross-shaped nanopillars, combined with a pillar-height offset and an optimized filling factor, redistributes the radiative and nonradiative losses and creates a pronounced loss contrast between the Γ-point A2 state and the competing modes. Subsequent anodization of the aluminum substrate further reduces the decay rate of the target mode and tunes the band edge into the gain region of Nile Red. Under 515 nm femtosecond-pulse excitation, the optimized structure achieves room-temperature single-mode lasing at 648 nm, with a threshold fluence of 6.3 μJ cm^{-2} $pulse^{-1}$, a linewidth of approximately 0.65 nm, and stable emission for more than 20 min. Pump-dependent spectroscopy, momentum-space imaging, self-interference measurements, and the polarization distributions of the first-order Fourier components consistently identify the lasing state as the Γ-point A2 band-edge mode. These results demonstrate that simultaneously achieving low absolute loss, sufficient loss contrast between competing modes, and finite radiative outcoupling is essential for stable single-mode lasing in plasmonic lattices.

Forum 4: Interdisciplinary Forum

Machine Learning assisted multiple scattering correction and cross-site applicability of ocean lidar attenuation retrievals under limited shallow water observations

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State Key Laboratory of Physical Oceanography, Institute of Oceanographic Instrumentation, Qilu University of Technology (Shandong Academy of Sciences)
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ABSTRACT

Ocean lidar provided an active means of resolving subsurface optical structure for coastal water quality assessment. However, attenuation retrieval in optically complex coastal waters was affected by multiple scattering and the regional dependence of empirical optical relationships. In this study, a dual-field-of-view ocean lidar combining polarized elastic backscatter, water Raman scattering, and chlorophyll a fluorescence was developed. An attenuation correction framework integrating semi-analytical Monte Carlo simulation with random forest, histogram gradient boosting, and CatBoost was evaluated using observations from four coastal campaigns. Simulations indicated that enhanced scattering increased the multiple scattering contribution to the received echo, whereas absorption mainly reduced return intensity under the tested conditions. In Jiaozhou Bay, CatBoost yielded the lowest root mean square error (RMSE) across 158 matched records under the specified reference scaling and depth matching procedure. RMSE decreased from 0.630 to 0.469 m^{-1} (25.6%), while the positive bias declined from 0.585 to 0.434 m^{-1} and the linear regression R^2 increased from 0.408 to 0.731. Waveform decay and elastic channel contrast were identified as influential inputs to the learned correction. Nevertheless, unphysical estimates for the withheld September campaign indicated limitations in model transfer. Field observations further revealed shallow fluorescence enhancement in the Yangtze Estuary and a distinct subsurface layer at an underwater path distance of approximately 6-8 m in the Yellow Sea. These contrasting structures indicated that pigment distribution and attenuation were not uniformly coupled across coastal environments. Overall, complementary multichannel observation and condition-dependent attenuation correction provided a methodological basis for characterizing subsurface optical heterogeneity and supporting coastal water quality monitoring.

Theoretical Redshift Signatures of Horizonless Compact Objects for Astrophotonic Spectroscopy

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imranhsakib@hrbeu.edu.cn

ABSTRACT

Horizonless compact objects provide a useful theoretical framework for exploring strong-field gravity and possible alternatives to black holes. In this work, we study the spectroscopic consequences of the analytic Imran-class compact-object model and develop a source-informed astrophotonic framework that connects relativistic predictions with measurable optical signatures. The theoretical model describes a regular, static, spherically symmetric interior that is smoothly matched to an exterior Schwarzschild spacetime. Its matter variables, mass function, compactness, stability conditions, and surface gravitational redshift are obtained analytically, allowing the observable consequences of changes in the internal geometry to be studied without introducing a thin shell. Our main focus is the relationship between compactness and gravitational redshift. The model shows that as compactness increases, the surface redshift rises systematically, shifting emitted spectral features toward longer wavelengths. This gives a direct theoretical link between the internal structure of a compact object and an observable spectroscopic quantity. We use representative optical lines as reference markers to translate the predicted redshift into specific target wavelengths, and we examine the spectrometer resolving power, wavelength accuracy, signal-to-noise ratio, and line recovery needed to distinguish between different compactness regimes. Altogether, this connects analytic strong-gravity theory with astrophotonic spectroscopy in a way that is grounded directly in the source physics. Experimental validation is currently underway. The planned laboratory measurements will reproduce the model's predicted wavelength shifts using controlled optical sources, testing how accurately the spectrometer can recover the target wavelengths and corresponding redshifts under realistic calibration and noise conditions. These experimental results will then be compared directly against the theoretical predictions. Overall, this work offers a practical bridge between horizonless compact-object theory and future astrophotonic tests of strong-gravity signatures.

Introduction of Organizer

Introduction of Harbin Engineering University

Harbin Engineering University (HEU), founded in 1953, is located in Harbin, near beautiful Songhua River. It is a national key university of glorious history and fine traditions. It is also an important base for talent cultivation and scientific research in the fields of ship industry, ocean exploration and nuclear application.

Historical Reform

1953：PLA Military Institute of Engineering
1994：Renamed as Harbin Engineering University
1996：The first batch of '211 Project' key construction universities of China
2011：One of the universities of '985 Advantage Subject Innovation Platform Project'
2017：One of the national 'Double-top' universities
2019：Co-constructed by the Ministry of Industry and Information Technology, Ministry of Education, Heilongjiang Province, Harbin City.



Features

In the past 67 years, the school has adhered to the national strategy, national defense needs and local economic development needs, formed a distinct "Three Oceans and One Nuclear" school characteristics, and has now developed into the largest high-level talent training base and one of the most important high-level scientific research bases in one of the most important high-level scientific research base.



Talent development

More than 120,000 senior professionals were trained, including more than 200 generals, ministers, governors and academicians of the People's Republic of China. More than 50,000 graduates will be sent directly to the national defense science, technology and industry system. The university is hailed as "a naval academy without military uniform".

Research platform

The university has more than 20 national-level scientific research platforms including national key laboratories, with ample scientific research funding, annual research funding per capita exceeding one million, and personalized scientific research equipment support.





Introduction of Qingdao Innovation and Development Center of Harbin Engineering University

Development Orientation

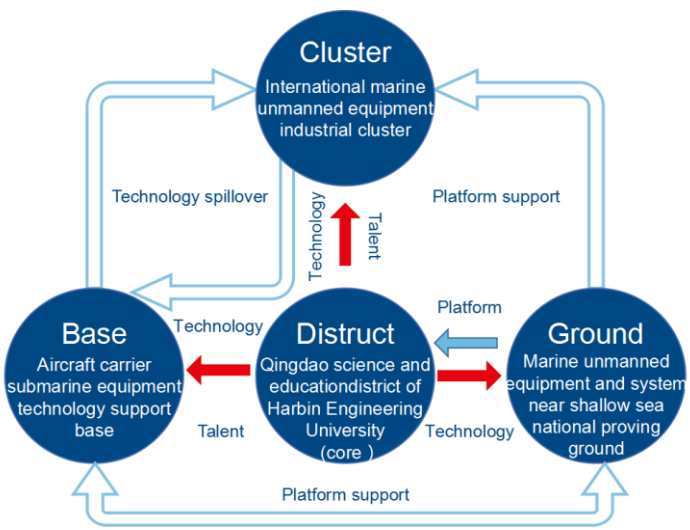
Qingdao innovation and development base takes the construction of campus as the standard, as the port of characteristic education, the extensional campus and experimental field of cross-disciplinary, which is closely connected with the positioning of "four functions" and seeks development in deeply connecting with the ocean strategy of our country and Shandong Province.

Positioning 1: Serving the needs of several disciplines for long-term ocean observation and the construction of permanent scientific research facilities, becoming an important base for offshore experiments.

Positioning 2: Taking the economic environment and geographical advantages to become an important base for attracting high-level innovative talents at home and abroad.

Positioning 3: Meeting the needs of international cooperation in schools, becoming an important base for HEU cooperatively-run school with world-class universities.

Positioning 4: Deeply integrate with sea-related organizations, and becoming an important base of HEU for the transformation and industrialization of ship-sea and related fields.



General plan

The Qingdao campus of Harbin Engineering University covers an area of 2,000 mu, with a total construction area of about 1.4 million square meters. Among them, the first phase covers an area of 352,078 square meters, including No. 11 comprehensive building, No.

41, No. 51 experimental building, student dormitory, teacher turnover apartment, canteen, international exchange center and No. 53 emerging basic interdisciplinary research building. Up to now, the first phase of the project will be completed and put into operation in December 2022.

General framework

Around the development goal of Qingdao base, strengthen the positioning of "Four Functions". Supporting the realization of the development goal and function positioning of Qingdao base by promoting the construction of "Four Major Projects (1 + 3)".

Science and education zone (Qingdao) of Harbin Engineering University.

It mainly carries out high-level personnel training, innovative scientific and technological research, international joint school running and school enterprise joint school running in the marine field, and arranges the specialties of ships and oceans, marine information, ship power, advanced nuclear energy and nuclear safety, marine new materials, marine science and cultural management.

Unmanned equipment and system near shallow sea national test site.

In the Qingdao sea area, with the characteristics of the unmanned system at sea, the comprehensive test capability of the unmanned system near the shallow sea is constructed to serve the full cycle of "technical research-equipment development-formation capability" of the unmanned system at sea, which is incorporated into the capability system of the National Offshore test field, so as to provide the guarantee conditions for basic and applied basic research for the Qingdao science and education zone.

International Marine unmanned equipment industry cluster.

Through the gathering of high-level talents, training of marine talents, marine technology and equipment technology innovation, achievement transformation and industrialization and other innovative elements in the whole field, we will create an international marine unmanned equipment industry cluster, drive the surrounding supporting industrial areas, realize the integration of industry and city, gather the first-line demonstration enterprises in the field of marine unmanned equipment, and build Qingdao International Marine unmanned equipment industry cluster with global competitiveness.

Carrier submarine equipment technical support base.

On the basis of the existing technical support center for ship equipment, relying on the talents and technical advantages in the field of marine technology and equipment in Qingdao science and education zone, the front support base for aircraft carrier, the submarine and other ship equipment technology will be established.

Introduction to the College of Physics and Optoelectronic Engineering, Harbin Engineering University




College of Physics and Optoelectronic Engineering, Harbin Engineering University
DEDICATION TO THE NATION
PURSUIT OF TRUTH
A BRIGHTER OCEAN
A MORE INNOVATIVE FUTURE
School Overview · Recruitment Areas
About HEU
Founded in 1953, predecessor: Harbin Military Engineering Institute ("Harbin Jun Gong"), one of the first higher military engineering institutions in New China.
In 1970, Harbin Shipbuilding Engineering Institute was established; in 1994, it was renamed Harbin Engineering University.
211
HEU is among the first group of universities in Project 211, the "985 Advantageous Discipline Innovation Platform", and the national "Double First-Class" initiative.
HEU is an important base for talent cultivation and scientific research in the "Three Seas and One Nuclear" fields.
About the School
The school evolved from the physics faculty of Harbin Military Engineering Institute founded in 1953.
Undergraduate majors: Optoelectronic Information Science and Engineering and Applied Physics.
Master's programs: Optical Engineering, Physics, and Electronic Information.
Doctoral program: Optical Engineering.
Postdoctoral research station: Optical Engineering.
"Optoelectronic Information Science and Engineering" is a National First-Class Undergraduate Major.
The school has three national-level platforms: National Experimental Teaching Demonstration Center for Physics, National Science Popularization Education Base, and National Training Base for Science Counselors.
Recruitment Areas
Meet National Strategic Needs — Pursue Academic Frontiers — Welcome Global Talents
Physics
Optics
Transient photonics; micro/nano-photonics; laser physics; biomedical optics.
Condensed Matter Physics
Condensed matter theory; micro/nano materials; soft-matter physics; liquid-crystal physics.
Acoustics
Underwater acoustics; applied acoustics; physical acoustics; nonlinear acoustics.
Particle and Nuclear Physics (Priority Area)
Elementary particle physics; nuclear reaction physics; cosmic-ray physics; accelerator physics.
Optical Engineering
Fiber Integrated Optics
Specialty optical fibers and microstructured fibers; fiber-integrated photonic devices; intelligent optical-fiber devices.
Fiber Optic Sensing and Optical Measurement
Distributed fiber sensing; optical extreme measurement; hyperspectral imaging.
Photonic Materials and Devices
Micro/nano optoelectronic materials and devices; metamaterials and devices; light-field regulation and energy devices.
Mid-Infrared Photonics
Mid-infrared fiber materials; mid-infrared fiber lasers; mid-infrared optical frequency combs.
Recruitment Plan / Benefits
Disciplines | Physics, Optics, Electronic Information, Materials, and interdisciplinary fields
Requirements | Good health, rigorous scholarship, integrity and ability
Eligibility | Under 35; PhD from a leading university in China or abroad; postdoctoral or overseas experience preferred
Career Path | Outstanding young talents may be directly appointed as associate professor or professor
Talent Policy | For exceptionally strong candidates, a tailored package may be offered
Work Locations | Harbin, Qingdao, Yantai
Benefits | Competitive salary; exceptional candidates may negotiate separately; full-time postdoctoral positions recruited year-round
Honors & Awards
2021 First Prize, Heilongjiang Natural Science Award
2021 Second Prize, Excellent Scientific Research Achievement Award for Higher Education Institutions, Ministry of Education
2022 Second Prize, State Grid Corporation of China Technology Invention Award
2023 First Prize, National Defense Science and Technology Invention Award
2023 Second Prize, National Defense Science and Technology Progress Award
2024 First Prize, China Association of Inventions Award
2024 Second Prize (2 items), Heilongjiang Science and Technology Award
Contact Us
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Scan to Learn More
College of Physics and Optoelectronic Engineering, Harbin Engineering University
Strong Foundations · Engineering Excellence
Seeking Innovation · Cultivating Talent

哈尔滨工程大学信息与通信工程学院/集成电路学院

哈尔滨工程大学是工业和信息化部直属重点高校，国家“211 工程”重点建设大学，国家优势学科创新平台项目建设高校，国家“双一流”建设高校，8 个学科进入 ESI 世界前 1%，其中工程学进入世界前 1‰。学校位于黑龙江省哈尔滨市。

信息与通信工程学院/集成电路学院溯源于中国人民解放军军事工程学院（哈军工）海军工程系和导弹工程系。1979 年，哈尔滨船舶工程学院（哈船院）电子工程系（八系）正式组建，2001 年更名为哈尔滨工程大学信息与通信工程学院。2025 年 12 月，集成电路学院正式成立，挂靠信息与通信工程学院管理，锚定“海洋芯片”核心方向，探索“跨学科融合、强领域交叉、重基础研究”的特色发展路径。

学院秉持“顶天立地、慧通空海”发展愿景，主动服务新型工业化与国防现代化建设战略需求，面向电子信息产业新兴赛道与未来产业布局，坚持立德树人、科教融汇、产教协同，着力培育政治过硬、功底深厚、红透专深的电子信息领域新质人才，为高水平科技自立自强和国防信息化建设提供坚实人才支撑与智力保障。

现有“信息与通信工程”、“电子科学与技术”、“电子信息”三个一级学科和“电子信息工程”、“通信工程”两个本科生专业。其中“信息与通信工程”学科是省部级重点学科，拥有一级学科博士点和博士后流动站，在全国最新一轮学科评估结果中信息与通信工程学科进入全国前 20%行列，是学校“双一流”国家级重点学科群成员。

依托学校光电、水声、导航、核学科特色优势，学院集成电路学科布局光子芯片、专用集成电路、MEMS 海洋传感器及惯性导航芯片等特色方向，积极探索“跨学科、强交叉、重基础”的特色发展路径，推动基础研究与工程应用深度融合，在船海核专用芯片、特种传感器等领域发挥重要作用。

一、重点招聘学科方向

集成电路科学与工程、信息与通信工程、电子科学与技术、计算机科学与技术、仪器科学与技术学科、光学工程、微电子与固体电子学、控制科学与工程、物理学等相关学科方向全日制海内外统招博士及脱产博士后。

二、应聘条件

1. 领军人才：学术领导力突出，取得国内外同行公认的重要成就，能引领学科赶超或保持国际领先水平。可直聘正高级职称、博士生导师。

2. 青芯学者：学术造诣高、创新能力强、发展潜力大，具备短期成长为自然科学、工程与技术科学前沿方向带头人的潜力。可聘为正高级职称、博士生导师。

3. 青创学者：科研能力突出，取得国内领先成就，研究水平居本领域国内外青年学者前列；一般不超过 40 周岁，优秀应届毕业生可直接申请。可直聘副高级职称、博士生导师。

4.青苗学者：获博士学位，学术基础扎实、创新能力较强，具有成长为青年拔尖人才的潜力；原则上不超过 32 周岁，优秀者可放宽。可直接认定准聘副教授职称。

5. 全职博士后：学术潜力较强，能胜任专职科研并有望较快成长为优秀青年教师；原则上不超过 35 周岁，获博士学位不超过 3 年。享单独职称晋升通道，获评副高级职称后可按程序申请留校任教。四、待遇保障

三、应聘方式

请应聘者发送个人简历至招聘邮箱，标注“应聘+姓名+岗位”。本招聘公告长期有效，欢迎广大专家学者随时提交申请材料。

邮箱

信息与通信工程：xtzhb@hrbeu.edu.cn

集成电路：heu_ic@hrbeu.edu.cn

Introduction of Photonic Materials Group

The Photonic Materials Group addresses national strategic challenges in precision micro/nano fabrication and laser chip processing. Research efforts are directed toward photonic crystals, plasmonics, and micro/nano optics, with established capabilities in micro/nano array fabrication, nanolasers, and strong coupling. Sample preparation is achievable from centimeter-scale to wafer-scale, overcoming the longstanding challenge of large-area fabrication of nanostructured samples. These efforts provide theoretical and technological foundations for next-generation photonic chips, photonic storage, and photonic communications.

Research Directions

(1) Two-Dimensional Micro/Nano Gratings

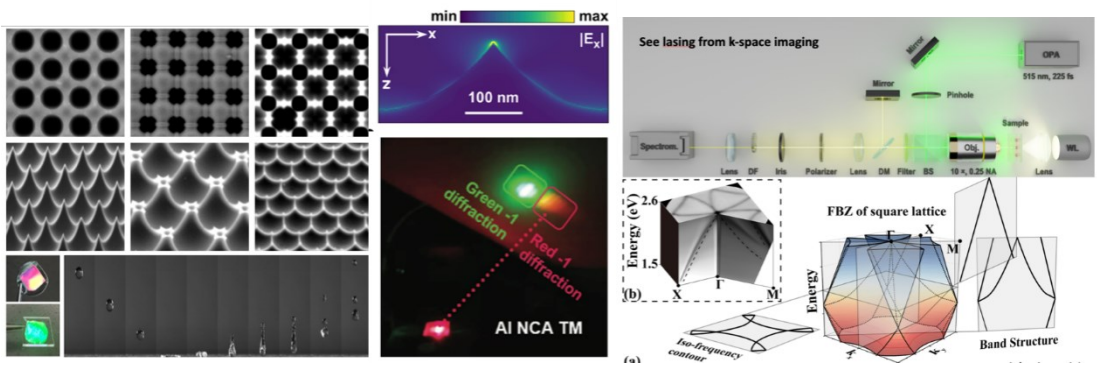
Proprietary micro/nano grating structures have been developed, along with ultra-high-precision modulation methods that circumvent the high time consumption and cost issues of conventional etching techniques. These capabilities are extended to smart wetting interfaces, enabling synergistic regulation and functional applications of light–heat–matter interactions.

(2) Nanolasers

Novel light sources have been developed to investigate light–matter interactions at the nanoscale, achieving nanolasers with ultra-small mode volumes beyond the optical diffraction limit. High-power semiconductor photonic-crystal surface-emitting laser chips and companion momentum-space imaging systems have also been realized.

(3) Strong Coupling

Within plasmonic lattices, both boson–boson and boson–fermion strong coupling are investigated through time evolution of the average photon number density, spectral anti-crossing, linewidth evolution, and Wigner function quasi-probability distribution analysis.



Information for Sponsor

Saifeite Engineering Technology Group Co., Ltd.

Founded in 2001 | 25+ Years of Industry Experience | 100+ IP Rights

About SAFEIT

Saifeite Engineering Technology Group Co., Ltd. was founded in 2001. Its name derives from "Safe + IT." Guided by its mission, "Safeguarding Safety with Intelligent Technology," the Group focuses on applying artificial intelligence and low-altitude intelligent equipment to industrial safety. It is a national-level specialized, sophisticated, distinctive and innovative "Little Giant" enterprise, a National Intellectual Property Advantage Enterprise, and a Shandong Provincial Gazelle Enterprise.

Product Matrix

01 Multi-source Perception Cameras Used in underwater imaging, forest fire prevention, power inspection, and other applications.

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02 Intelligent Inspection Robot Dog Used in power, energy, transportation, and other industries.

03 Data Collection Platform Scalable robot-free data collection + real-robot teleoperation + precision data collection with collaborative robots.

04 UAV Virtual Tower An integrated hardware-software operation and control system for the low-altitude economy.

Contact Information

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Tel: 18543116553
Email: sftxc@sft360.com
Website: https://www.sft360.com

United Nations Educational, Scientific and Cultural Organization
International Day of Light
创锐光谱 TIME-TECH SPECTRA

超快瞬态吸收光谱系统

超宽光谱探测
覆盖280-2200 nm

超高灵敏度
高信噪比低至10^{-6}OD

超高速扫描
90点扫描仅需10 秒

专业拓展
外场调控、AFM、E-TA等

瞬态荧光测试
支持克尔门、上转换等

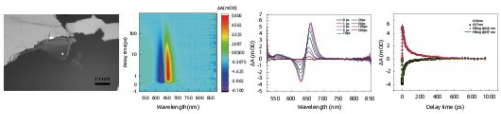
首发近场光学成像
空间分辨率低至60 nm



全栈式飞秒瞬态吸收光谱检测系统

微区透射模式

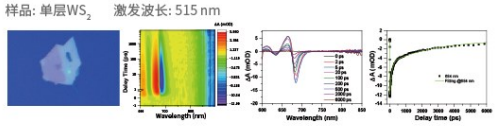
样品: WS_2　激发波长: 515 nm　探测波长:500-850 nm



明场成像　瞬态吸收光谱　瞬态吸收光谱　瞬态吸收动力学

微区反射模式

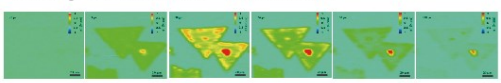
样品: 单层WS_2　激发波长: 515 nm



明场成像　瞬态吸收光谱　瞬态吸收光谱　瞬态吸收动力学

TA动力学成像

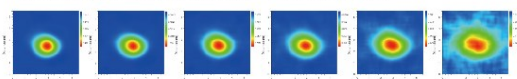
样品: WS_2　激发波长: 515 nm　探测波长: 610 nm



-2 ps　1 ps　10 ps　20 ps　50 ps　100 ps

载流子迁移成像

样品: 全氟酞菁铜　激发波长: 650 nm　探测波长: 510 nm



1.2ps　8.8ps　19ps　40ps　67.2ps　183.4ps

多功能激光扫描共聚焦荧光成像系统

[同时具备时间分辨、光谱分辨和空间分辨功能]

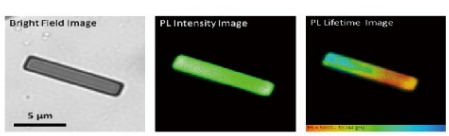
多功能测试集于一体

- 荧光强度成像
- 荧光/拉曼光谱
- 载流子迁移成像
- 荧光寿命成像
- 电致发光成像
- 光电流成像



荧光强度和荧光寿命成像

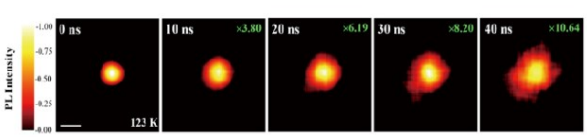
样品:$MAPbI_3$ 纳米线



光学明场成像　荧光强度成像　荧光寿命成像

载流子迁移成像

样品名称: $Cs_2AgBiBr_6$ 钙钛矿　物镜:100X　激发波长:400 nm



不同时刻下的载流子迁移成像

哈尔滨工程大学 HARBIN ENGINEERING UNIVERSITY
TECHNISCHE UNIVERSITÄT ILMENAU
WILEY
NANO · MICRO small
Energy& Environmental Materials
CARBON ENERGY

创锐光谱
TIME-TECH SPECTRA
时间分辨光谱技术全球领军企业

公司简介

创锐光谱创立于2016年，是深耕时间分辨领域的高新技术企业。团队依托顶尖科研背景，以超快瞬态吸收技术为核心，打破海外技术垄断，核心部件完全自研，瞬态吸收设备国内市占超70%。自研集成式纳秒激光器性能稳定、环境适应性强，适配多前沿领域应用；自主研发高速双线阵探测器，技术指标全球领先。依托硬核光电技术沉淀，布局半导体、新能源检测赛道，以高端仪器国产化创新，持续赋能科研与工业发展。

全球领先的瞬态光谱技术产业化企业
大连、杭州、南京三大产研中心

累计销售仪器500+套
服务于100+所国内外高校和科研单位

团队带头人拥有20+年
瞬态吸收研究经验技术底蕴深厚强大
总人数200+ 硕博人才60+

目前国内唯一具备瞬态光谱
独立研发-生产-应用完整能力体系的团队
SiC衬底检测唯一实现无损检测技术的企业

实现光谱学系统、激光器
探测器、自动化控制等关键
技术全自主开发

基于瞬态吸收光谱技术
构建基础科学研究
到泛半导体检测全领域产品

产品系列

瞬态吸收系列
·超快瞬态吸收(显微成像)光谱系统
·超快时间分辨太赫兹光谱仪
·超快泵浦探测阴影成像系统
·纳秒瞬态吸收光谱系统
·闪光光解系统

荧光光谱系列
·多功能激光扫描共聚焦荧光成像系统
·科研级钙钛矿材料/器件综合光谱表征系统
·科研级宽禁带半导体综合表征系统
·超快荧光光谱系统
·稳态/瞬态荧光光谱系统

激光器系列
·大能量DPSS Nd:YAG纳秒激光器
·高能高频 Nd:YAG-OPO一体机
·可调谐纳秒脉冲染料激光器
·光参量振荡器/放大器
·激光放大器

非线性光学系列
·非线性SHG测试系统
·Z扫描测试系统

科研探测器系列
·Lynceus Series 深制冷光谱型探测器
·Zephyrus 系列高速探测器
·HPS Series 高精度单色仪/光谱仪

泛半导体光学检测系列
·全自动SiC衬底位错缺陷无损检测系统
·晶圆少子寿命成像系统
·钙钛矿光伏综合检测设备

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让光谱简单


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近红外光谱仪


◆ NOVA-EVO
制冷型光纤光谱仪


◆ PG2000-EVO
面阵背照式光谱仪


◆ SINO
工业高速光谱仪


◆ FX4000
微型光谱仪


◆ PG4000
高分辨光谱仪


◆ BLAZE-MC6
高分辨多通道等离子光谱仪

光谱分析仪器
精准光谱 · 智测未来


◆ MetronLens
超构透镜光学检测系统


◆ ARMS
显微角分辨光谱仪


◆ R1 角分辨光谱仪


◆ gora-FLIM
显微稳瞬态光谱系统


◆ gora-Lite
显微拉曼光谱仪

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以精准光学表征，助您掌控每一层薄膜


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全自动穆勒矩阵椭偏仪


◆ MetronSEE
光谱椭偏仪


◆ MetronFilm-MS
显微级反射膜厚测量仪



◆ MetronFilm
反射膜厚测量仪

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MICRO NANO 迈科英诺

上海迈科英诺科学仪器有限公司

Tabletop Analytical SEM
(EBSD Version / Glove Box Version / Standard Version)

High End EM Sample Preparation Equipment:
Ion Beam Milling & Plasma Cleaning

迈科英诺

FIB SEM Vacuum Interconnection & Cryogenic Solutions

In situ TEM Sample Holders

01 Semplor NANOS Tabletop Analytical Scanning Electron Microscope



Tabletop Analytical Scanning Electron Microscope

The Semplor NANOS delivers outstanding SEM imaging and EDS elemental analysis performance. It adopts a uniquely designed tungsten filament with a service life exceeding1000hours. Equipped with a eucentric sample stage and low vacuum capability, it accommodates diverse application requirements.



Tabletop SEM

The NANOS is a fully featured, cost effective Tabletop scanning electron microscope (SEM). It supports auto focus and auto astigmatism correction for fast, high quality SEM image acquisition.



EBSD Version

The new generation NANOS can be fitted with an EBSD detector , bringing research grade crystallographicanaly sis capability to a compact Tabletop SEM and substantially lowering the technical barrier for EBSD applications.



The ONYX Tabletop SEM

The ONYX Tabletop SEM features the largest sample stage of any tabletop SEM. Its 110 × 110 mm motorized stage supports up to 64 half-inch SEM sample stubs and delivers intuitive, automated solutions that reduce repetitive manual tasks.



Glove Box Version

The glove box compatible variant can be installed inside a glove box for direct characterization of moisture- and oxygen sensitive specimens.

02 High End Electron Microscopy Sample Preparation Equipment



UFM 1000 Ion Beam Cross Section Polisher

Focused argon ion beam bombardment produces stress free, strain free, amorphous-layer-free surfaces for SEM, EBSD, AFM and optical microscopy (OM) surface analysis.



UFM 2000 Ion Thinner

Focused argon ion beams bombard the specimen surface to fabricate electron transparent thin areas suitable for TEM observation.



MIPC1000 Multi-Function Plasma Cleaner

For surface and micro analytical applications on SEM, TEM and other instruments, it effectively removes contaminants on specimens and sample holders, mitigating carbon deposition which degrades image resolution and introduces artefacts during micro-area compositional analysis.



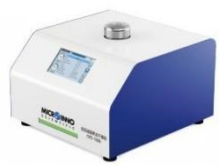
MIPC1020 In line Plasma Cleaner

Designed for in situ online cleaning of molecular pumped and ultra high vacuum systems including FIB SEM, NanoProber, TEM and XPS. It removes contaminants from samples and chamber interiors to prevent resolution degradation and misinterpretation of micro area compositional analysis caused by carbon deposition, and reduces chamber pump down time.



TCP 1000 Precision Cutting & Polishing System

Dedicated to precision preparation of small size samples for OM / SEM / EBSD / TEM. Featuring a CCD visualisation system, it enables precise process control and end point detection to enhance preparation repeatability and reliability.



CPD 1000 Automated Critical Point Dryer

Developed for biological cell specimens, porous MOF/COF materials, hydrogels and other porous samples. It eliminates microstructural damage caused by surface tension during drying.

哈尔滨工程大学 HARBIN ENGINEERING UNIVERSITY · TECHNISCHE UNIVERSITÄT ILMENAU · WILEY · NANO · MICRO small · Energy& Environmental Materials · CARBON ENERGY

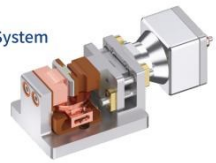
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03 FIB SEM Accessories

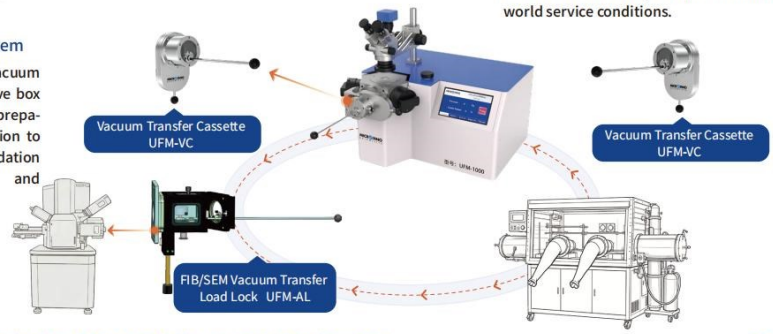


CRYO-1000
Cryo Preparation & Transfer System
Direct coupled architecture. Water- or oil containing specimens can be prepared and transferred directly for high resolution FIB SEM observation and analysis.



ECS-1000
Constant Pressure Variable Temperature
Provides constant pressure and programmable temperature control while enabling charge discharge electrochemical testing. It realistically simulates the evolution of the structure-performance relationship for solid state battery samples under real world service conditions.

UFM-AL/VC
Vacuum Transfer System
It delivers full process vacuum protection covering glove box manipulation, sample preparation and EM observation to prevent sample degradation induced by moisture and oxygen.



04 In situ Transmission Electron Microscopy Equipment



WIPM001
Molecular Pump Vacuum Station
High vacuum storage for TEM sample holders and SEM specimens. It adopts a two stage vacuum system consisting of a mechanical pump and a turbomolecular pump; it also supports high vacuum leak checking for liquid cell /gas cell in situ TEM holders.



WIPM002 Multi-Function
Molecular Pump Vacuum Station
Benchtop storage unit for TEM sample holders, expandable with plasma cleaning, infrared baking, and featuring a liquid nitrogen cold finger for molecular sieve regeneration.



WITH001ST
Multi-Position TEM Sample Holder
Holds multiple specimens in a single loading operation to reduce sample exchange frequency. Specimens are secured by individual hexagonal rings for high mechanical stability and improved TEM throughput.



MKH005 Double Tilt
Cryo TEM Sample Holder
One of the in situ TEM holder series. Enables microstructural characterization at cryogenic and variable temperatures for in situ phase transition studies, condensed matter physics and superconductivity research.



MIVTHD Double Tilt Vacuum
Transfer TEM Sample Holder
Enables specimen transfer under controlled inert gas or high vacuum environments. Effectively addresses transfer challenges for moisture- and oxygen-sensitive materials including lithium ion batteries, perovskites, catalysts and reactive metals.

V2.2026.09.23
Tel:021-67636879 Address:Building 8, Lingang Fudan Science Park, Songjiang District, Shanghai, P.R.China
E-mail:info@shmicroinno.com Website:www.shmicroinno.com
MICRO INNO SCIENTIFIC

Beijing Light-QuantumTechnology Co., Ltd. is the official agent of Light Conversionin China, specializing in the promotion and service of ultrafast laser and spectroscopic imaging products. Headquartered in Beijing, it has offices in Hangzhou, Changchun and Shenzhen to deliver timely and efficient services to customers across different regions.



The company's products cover a wide range of application fields, including femtosecond ultrafast spectroscopy,super-resolution optical imaging, femtosecond micro-nano fabrication, combustion research, time-resolved angle-resolved photoelectron spectroscopy, attosecond science, high harmonic generation, terahertz technology, 2D infrared/electronic spectroscopy, Raman spectroscopy, astrophysics, neuroimaging, optogenetics, multiphoton imaging, etc.



PHAROS Femtosecond Laser



UV/VIS/NIR Transient Absorption Spectroscopy System



Femtosecond Laser Micro-Nano Machining Workstation



Optical Parametric Amplifier



Current / Voltage Amplifier



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Tescan 致力于打造先进影像系统，协助科学家与工程师探索微米与纳米世界，将观察化为洞察、化问题为突破的起点。

公司创立于 1991 年，从 5 位工程师起步，迄今已发展为在 11 个国家拥有逾 800 名员工的全球企业，并以 Accelerating the Art of Discovery 为品牌理念，为全球材料研究、失效分析与纳米尺度成像提供支持；目前在 80 多个国家累计安装近 4,500 套系统。

2025 年，Tescan 集团凭借 TESCAN AMBER X 2（搭载 Mistral™等离子体 FIB 镜筒）在分析/测试领域荣获 R&D 100 大奖，彰显其成果为导向的方案理念。

2024 年，Tescan 集团收购了 EXpressLO LLC 及其专利组合，新增精密台面控制和样品处理能力，进一步增添技术底蕴，增强全球影响力。同年，集团通过收购 TESCAN KOREA Co., Ltd. 和 DML Co., Ltd. 扩大了在亚洲的业务版图，并在台湾和新加坡成立新的子公司，进一步强化了为发现之地的科学家提供服务的承诺。自 2013 年以来，Tescan 集团通过一系列战略性收购，不断拓展专业领域，磨砺技术优势。与 ORSAY PHYSICS 的合并，为集团带来了先进的聚焦离子束和电子束技术。2018 年，收购 XRE 进一步拓展了 Tescan 在动态 micro-CT 方面的能力，为无损分析开辟了新赛道。2023 年，TESCAN ORSAY HOLDING 及其子公司被美国私募股权公司 Carlyle 收购，标志着集团开启了持续创新和全球拓展的新篇章。

Tescan 集团总部位于“电镜之乡”捷克布尔诺，这里不仅是仪器主要的生产中心，负责设计、组装和测试，也是科研技术交流中心，加速全球科学家与先进实验室探索发现的进程。

媒体联系人

如需进一步信息、采访请求或媒体咨询，请联系：

Linda Bilal，全球营销与品牌战略专家

市场部

地址：Tescan Group, Libušina třída 21; 623 00 Brno – Czech Republic

电话：+420 778 788 844

邮箱：linda.bilal@tescan.com

邮箱：k.sucha@omnimedia.cz

Information for Participants

Conference Information

The conference will be held on Oct. 7th- Oct. 10th, 2026 in Qingdao, China

Website: http://www.aefm.cn/ https://www.tu-ilmenau.de/aefm-2026

E-mail: osa@hrbeu.edu.cn

Conference Registration

Conference Address: Harbin Engineering University Qingdao Innovation and Development Base, No.1 Taolin Road, West Coast New Area, Qingdao, Shandong Province, China

Registration will start on Oct. 7th and receiption desk in the foyer of Building #11.

For a detailed map of the campus and buildings, please find in the end of this booklet.

Notice

1. You will receive your name tag at the registration desk. It is suggested that the name tag should be worn visibly during the entire conference.

2. The staffs and student assistants of the conference are at the conference sites. Please contact them if you have any questions.

Oral Presentation

Lecturers are requested to provide their presentations electronically. All the lecture rooms are equipped with projectors (“beamers”). All presentations, including plenary, keynote, invited, and oral talks, will be delivered in **English**.

Laptops will be provided by the speakers or the conference organizers. All the rooms will be opened at least 30 minutes before the lectures. Speakers should be in the lecture room at least 15 minutes before the start of the session to contact with the chairperson as well as the technical staff to ensure that the laptops handshake with the beamer and to

receive a brief introduction to the equipment in the lecture room.

Poster Section

Site for poster session is in Building #11 from 9:00 on Oct 8th.

The poster boards will be ready at 19:00 p.m. on Oct. 7th. Authors can mount their poster when the poster board is prepared. The poster should be presented for the whole session time. The presenting authors are encouraged to be at the hand for discussion at their poster.

Traffic Information



Transportation Options

1. Qingdao Jiaodong International Airport

(1) Public Transit: 3 hours and 15 minutes

Take Metro Line 8 (towards Qingdao North Railway Station) inside Jiaodong Airport Station to Qingdao North Railway Station. Transfer to Metro Line 1 (towards Wangjiagang) at the same station to Jinggangshan Road Metro Station. Transfer to Metro Line 13 (towards Dongjiakou Railway Station) at the same station to Shenghai Road Metro Station. Then take Bus Route 1823 (towards Lianxin Fishing Port) and get off at Harbin Engineering University Bus Stop.

(2) Ride-hailing / Taxi: 1 hour and 20 minutes

2. Qingdao Railway Station

(1) Public Transit: 2 hours and 20 minutes

Take Metro Line 1 (towards Wangjiagang) inside the railway station to Jinggangshan Road Metro Station. Transfer to Metro Line 13 (towards Dongjiakou Railway Station) at the same station to Shenghai Road Metro Station. Then take Bus Route 1823 (towards Lianxin Fishing Port) and get off at Harbin Engineering University Bus Stop.

(2) Ride-hailing / Taxi: 1 hour and 10 minutes

3. Qingdao North Railway Station

(1) Public Transit: 2 hours and 54 minutes

Take Metro Line 1 (towards Wangjiagang) inside the railway station to Jinggangshan Road Metro Station. Transfer to Metro Line 13 (towards Dongjiakou Railway Station) at the same station to Shenghai Road Metro Station. Then take Bus Route 1823 (towards Lianxin Fishing Port) and get off at Harbin Engineering University Bus Stop.

(2) Ride-hailing / Taxi: 1 hour and 20 minutes

4. Qingdao West Railway Station

(1) Public Transit: 1 hour and 48 minutes

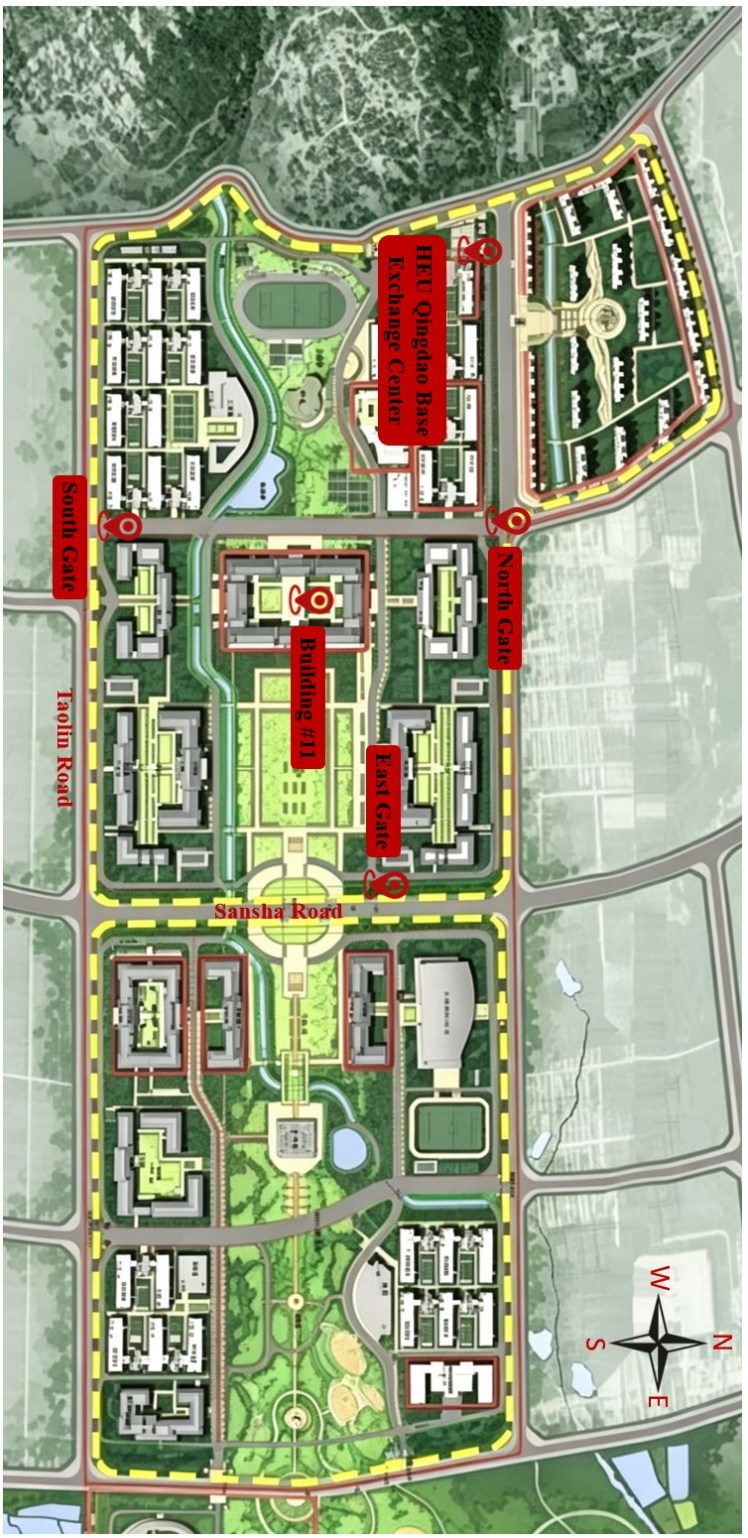
At Qingdao West Railway Station Bus Stop, take Bus Route 1066 (towards Ronghai Mansion) to Langyatai Group Bus Stop. Transfer to Bus Route 1823 (towards Lianxin Fishing Port) and get off at Harbin Engineering University Bus Stop.

(2) Ride-hailing / Taxi: 30 minutes

Campus Map

For pedestrian access, please enter through the East Gate or North Gate.

For vehicle access, please enter through the South Gate or North Gate.



AEFM-Wiley 2026 Live Photo Gallery

Scan to view and share conference moments

扫码查看与分享会议精彩瞬间

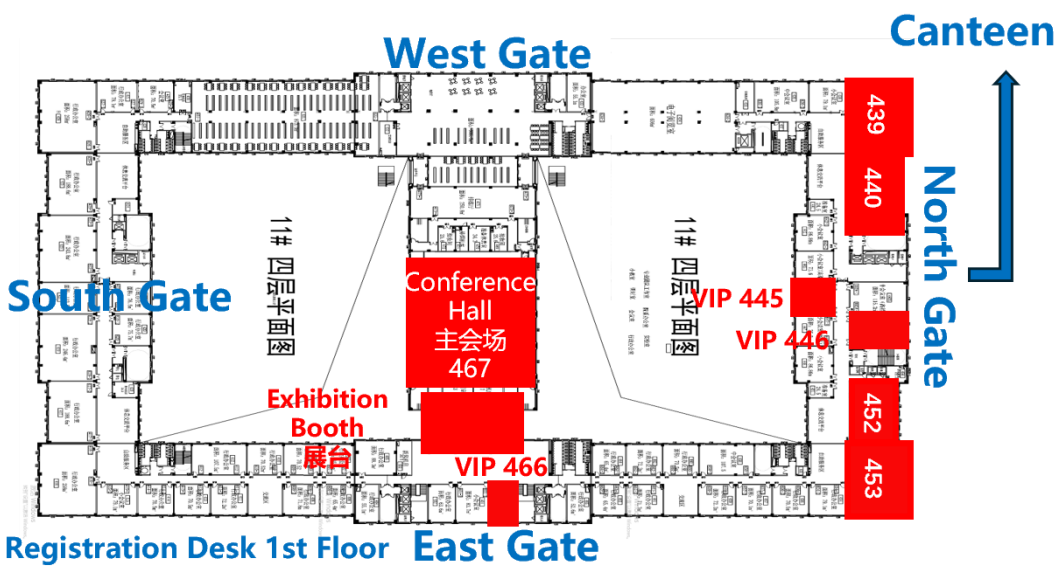
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See you at the next conference!!